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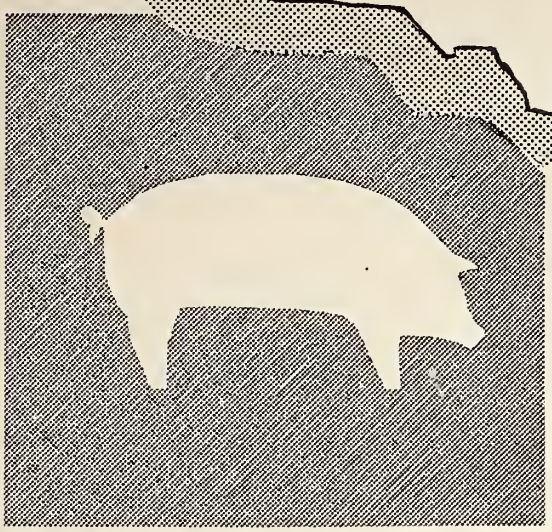
Marketing Meat-Type Hogs



PROBLEMS, PRACTICES AND POTENTIALS IN THE UNITED STATES AND CANADA

Marketing Research Division
Agricultural Marketing Service
UNITED STATES DEPARTMENT OF AGRICULTURE

MARKETING RESEARCH REPORT NO. 227

PREFACE

This report was prepared at the suggestion of the House of Representatives Subcommittee on Agricultural Appropriations. The subcommittee recommended that officials of the Department of Agriculture make a thorough study of the Canadian program of swine quality improvement. To learn of possible applications of Canadian methods to United States production and marketing procedures for swine, the Department sent an American Swine Study Mission to Canada. The mission consisted of the following:

Assignment	Name
Livestock marketing economist and chairman of the mission	Gerald Engelman, Agricultural Marketing Service, U. S. Department of Agriculture
Swine nutrition and breeding specialist	John Zeller, Agricultural Research Service, U. S. Department of Agriculture
Meat technologist	Daniel E. Brady, Foreign Agricultural Service, U. S. Department of Agriculture
Swine and pork grading specialist	C. Lowell Strong, Agricultural Marketing Service, U. S. Department of Agriculture
Extension livestock marketing specialist	Robert J. Reierson, University of Wisconsin
Swine producer	Marion Steddom, President, Iowa Swine Producers Association
Livestock marketing economist and secretary of the mission	Raymond O. Gaarder, Agricultural Marketing Service, U. S. Department of Agriculture

Officials of the Canada Department of Agriculture and other Canadian agencies, as well as a number of private individuals, were most helpful to the American Study Mission during its visit to eastern Canada, September 29 to October 11, 1957.

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Washington, D. C. April 1958

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SUMMARY

The production and marketing of meat-type hogs is one of the more important problems in American agriculture today. Several longtime underlying trends demonstrate the gradual emergence of this problem.

One of these is the declining demand for lard. There has been, since the beginning of this century, a rather constant widening of the gap between the prices of the important lean cuts of pork (hams, loins, picnics, and butts), and of fat for lard. Fat was worth nearly as much as lean cuts in the early part of the century. In 1957, however, the lean cuts, pound for pound, were worth 2 1/2 times as much as fat.

Another underlying trend with even more critical implications for hog producers suggests a declining demand for pork, especially in relation to competing meats. Expenditures for pork dropped from around 3 1/4 percent of consumer income in the early 1930's to about 2 percent in 1957. Consumer expenditures for beef increased from 2 1/3 percent of income in those earlier years to 2 2/3 percent recently.

These are indications that a leaner, meatier type of hog is urgently needed in the United States. Consumers would probably consume more pork if they were assured a tastier, leaner type of pork. Also, farmers would probably raise more meat-type hogs if an appropriate price differential were paid in the market.

A team of swine production and marketing specialists sent to Canada in October 1957 by the U. S. Department of Agriculture, at the suggestion of a Congressional subcommittee, found that the average quality of Canadian market hogs is very high by United States standards. Under Canadian grade standards, 28 percent were Grade A, about 51 percent were Grade B, and about 10 percent were Grade C in 1956. This means that under the U. S. standards, first developed by the Department of Agriculture in 1949 and revised several times since, about 71 percent of the Canadian market hogs would grade U. S. No. 1, and about 26 percent would grade No. 2--most of them in the top half of the grade. The Canadians appear to have almost eliminated the U. S. No. 3 from their supply of market hogs.

No reliable figures are available on the grade consisting of barrows and gilts in the United States (the distribution of the hogs among the various grades). Various estimates, however, have ranged between 15 and 30 percent of all barrows and gilts grading U. S. No. 1.

Grading of live hogs in Canada was initiated on an optional basis in the fall of 1922. Little progress was made in improving quality during the optional grading period from 1922 to 1928.

Nearly all of the progress in improving quality of market hogs in Canada was made during the period of compulsory live grading from 1928 to 1940. In 1934, Canada began shifting to the carcass weight and grade method of marketing hogs. In 1940, this system was made the single official system of marketing and pricing hogs throughout the country.

In 1929, 35 percent of the hogs in Canada were of what was then called "butcher grade" (relatively fat hogs). By 1940, that percentage had dropped to 8.2 percent. Comparable increases in the production of leaner grades of hogs took place during the same time. The relatively stable grade distribution since the early 1940's suggests that Canadian hogs may have become leaner genetically, inasmuch as live weights of hogs marketed have increased about 20 pounds during this period.

Meatpackers in Canada pay price differentials between grades 2 1/2 or 3 times wider than have been thought possible in the United States. These wider price differentials are made practicable in Canada by added processing and standardization of wholesale cuts. Many of the cured cuts of pork in Canada are boned and defatted and sold to Canadian consumers as practically all-meat products. This increases the price per pound at wholesale and retail, and also widens the differences in physical yields of lean cuts between Grade A and Grade C carcasses.

Another factor that may have helped to account for the high quality of Canadian hogs is the fact that the basic grain concentrates used in the ration are oats and barley. These grains have a somewhat lower energy (fat building) content than corn, which is likely to be the basic grain ration in the United States for some time to come.

The high heritability of meat-type in hogs, the relatively short time required for hogs to reach maturity, the short gestation period and large litter size characteristic of hogs, and the extent of commercial hog production in the United States combine to offer promise of rapid progress toward development and wider use of meatier genotypes in the United States, if the market provides producers appropriate price incentives.

The basic problems in establishing effective price differentials between grades of hogs or of hog carcasses in the United States are: (1) To generate wider price differentials between the products from different carcass grades, and (2) to relay these wider price differentials to farmers more effectively, more accurately, and more completely. Based on the Canadian experience, it would seem that wider price differentials between the products could be generated in the United States by further processing, boning, and defatting many of the cured cuts, and possibly by developing and using adequate grade standards for other cuts at the wholesale and retail levels. Carcass selling relays these wider differentials to farmers most accurately. But Canadian experience several decades ago suggests that compulsory live grading has also relayed these differentials to producers fairly effectively.

With uniform and universal grading as practiced in Canada, and with price differentials equivalent to those paid farmers by Canadian meatpackers, even greater progress in improving hog quality could probably be achieved in the United States.

MARKETING MEAT-TYPE HOGS

Problems, Practices, and Potentials in the United States and Canada

By Gerald Engelman and Raymond O. Gaarder
agricultural economists,
Marketing Research Division
Agricultural Marketing Service

INTRODUCTION

In submitting its report on the Department of Agriculture and Farm Credit Administration Appropriation Bill for 1958, the Subcommittee on Agriculture of the House Committee on Appropriations gave particular emphasis to what is often called the meat-type hog problem.[1] The subcommittee stated that during the previous year it had received considerable testimony on this subject. There was general agreement that an expanded production of meat-type hogs is desirable. Hogs of meat-type strains have been developed in this country for some time. Members of the subcommittee said that farmers developing meat-type hogs do not find it possible to obtain a fair price in the market for their extra efforts. Consumers might consume more pork if they were assured of tasty, lean pork. Hog producers and the entire hog industry suffer because of the lack of price advantage that would encourage the production of a type of pork more marketable at the retail level.

The subcommittee indicated that it understood that Canada has made progress in providing incentives for the production of this type of animal, and that the progress is reflected in increased markets and prices for Canadian hogs, especially for A grade carcasses. The subcommittee recommended that appropriate officials of the Department make a thorough study of the Canadian program so as to develop better markets and prices to American hog producers.

In response to that request, the Department sent a team of seven swine production and marketing specialists to visit Canada. The study team was instructed to pay particular attention to the grading and marketing methods in Canada. It was to appraise the effects of these methods on the characteristics of pork production in Canada and to give attention to the methods and techniques used in swine improvement.

This report consists of three main sections. The first section discusses the emergence of the pork quality problem in the United States and some of the basic economic trends with which it has been associated. The second section reports on the history, the experience, and the present status of the Canadian swine industry in solving its problems with respect to producing and marketing its bacon-type hog. A final section appraises progress made in both countries, and discusses possible alternative courses of action for this country to follow, so as to produce and market a type of hog that yields less fat and more lean meat.

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[1] Union Calendar No. 143, Report No. 438, House of Representatives, 85th Congress, 1st Session, May 10, 1957, to accompany H. R. 7741, Department of Agriculture and Farm Credit Administration Appropriation Bill, 1958.

THE PORK PROBLEM

The production and marketing of meat-type hogs is one of the more important problems in American agriculture today. The essence of the marketing problem concerns the role of price incentives in the decentralized decision-making that marks the free-market pricing system characteristic of our country. The essence of the production problem concerns how well producers respond to price incentives offered for meat-type pork by changing the type of hog produced.

Our pricing system is intended to be one in which consumers are able to demonstrate their choices freely in the market place. Through the medium of prices, consumers are expected to indicate their preferences for what they want to buy. In this way, they can give direction, they are able to call the signals, for a large part of our productive economy. For farm products, signals called by the consumer are relayed from the retail level back to the wholesale and processing levels and then back to farmers.

But, in some cases, consumers do not have enough choices available to permit them to call the particular signals they would like. In others, the signals are called rather clearly at the retail level, but certain impediments, frictions, or resistances interfere with the pricing mechanism so that the signals get lost or diffused by the time they reach the farmer. Even with proper price incentives for the production of preferred meat-type hogs, it may be difficult for many farmers to develop or discover strains of meat-type swine or to manage them in such a way as to produce a larger proportion of meat-type hogs.

The Declining Demand for Lard

The longtime trends of declining demand for fat pork and lard illustrate some of the price signals that consumers have been calling for several years; but current hog pricing methods have not transmitted these signals to the farmer very well. Figure 1 shows the wholesale prices at Chicago for certain pork items since 1905. In the earlier part of the present century, loins, bellies, lard, and plates and jowls were all selling relatively close to the same figure. Before 1920, prices for lard and for the fat cuts which are readily converted into lard were supported by a relatively strong export demand as well as by a rather strong domestic demand. In later years, loins--one of the four major lean cuts--have been in greater demand, and their prices have generally trended sharply upward. Prices for ham, butts, and picnics, the remaining lean cuts not shown in figure 1, have followed trends similar to that for loins.

Bellies, which are sold primarily as bacon, are in an intermediate price position. Wholesale bellies have not increased in price as much as have loins and hams, but they are in a stronger position than lard and other fat.

In the earlier part of this period, lard commanded as high a price as any other major pork item. Today it is the cheapest major pork product. It sells for about a third of the price of lean cuts. Fat cuts sell for about a fourth of the price of the lean cuts.

Declining prices for lard, relative to the prices of lean cuts, mean that more and more of the total value returned from each hog has had to come from the lean cuts. Figure 2 shows that the lean cuts contributed about half of the total value of the hog in 1905, but over six-tenths of the value in 1957. On the other hand, lard contributed about 24 percent in 1905, but less than 12 percent in 1957. Constant yields of the different pork items are assumed for this comparison.

Diverging trends of prices for fat and lean cuts are shown somewhat more dramatically in figure 3. This shows average prices for the lean cuts and prices for the fat portions of the carcass that are normally rendered into lard, in relation to live hog values. There has been a rather constant widening of the gap between prices of lean cuts and of

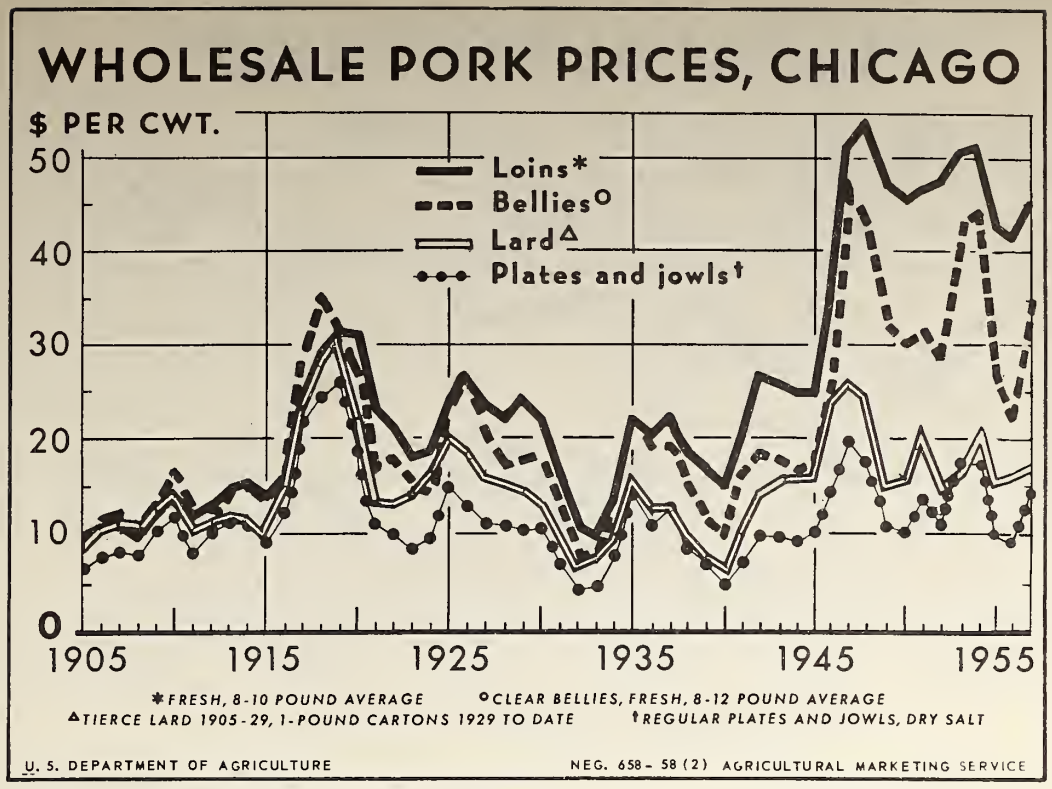
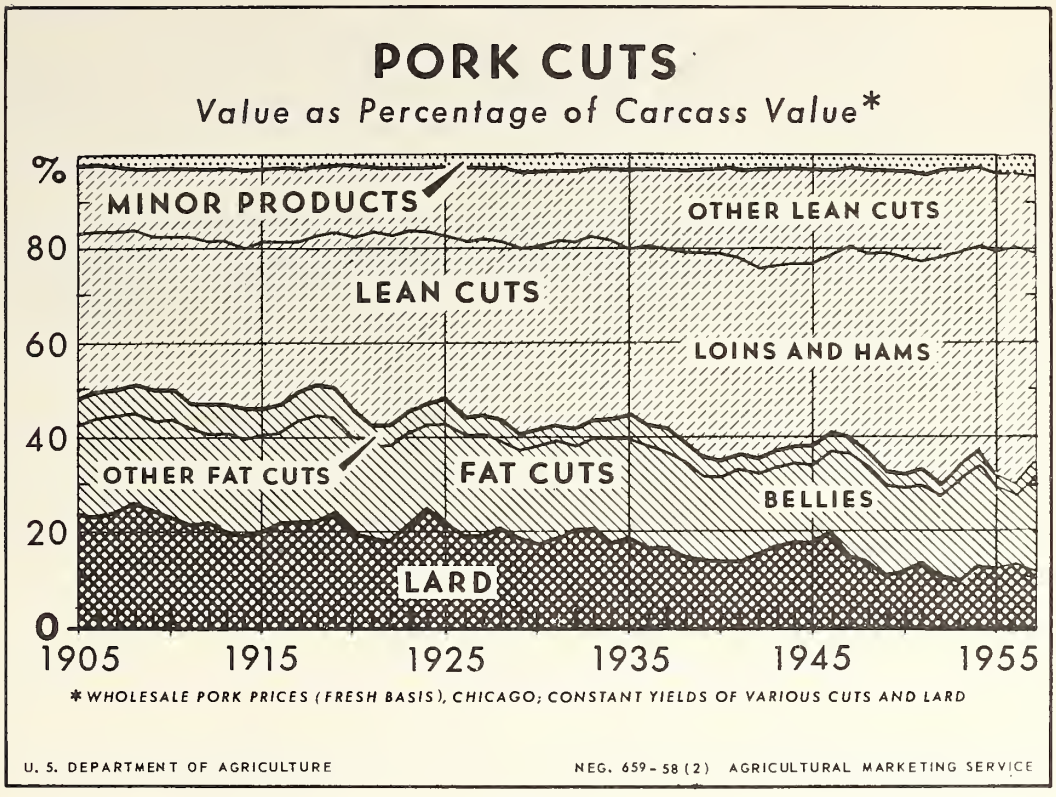


Figure 1.



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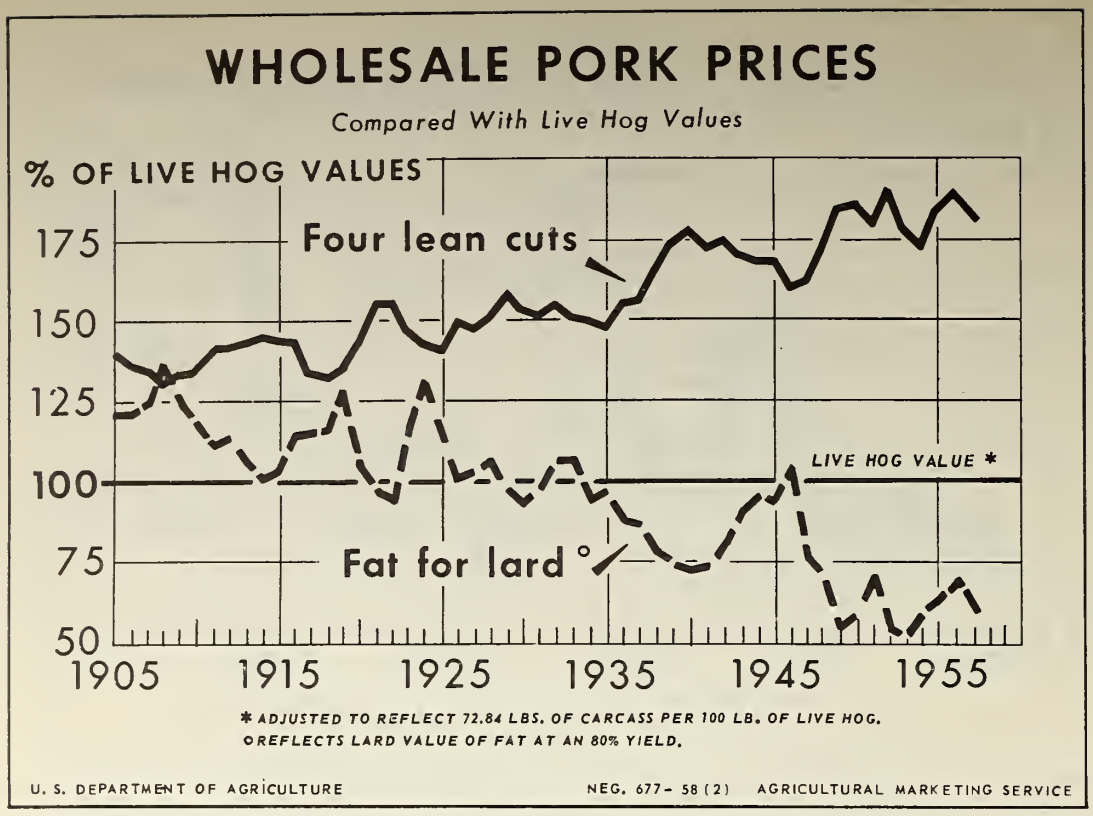


Figure 3.

fat for lard from the beginning of the century up to the present. Fat was worth nearly as much as lean cuts in the earlier part of the century. In 1957, however, lean cuts, pound for pound, were worth almost 3 times as much as fat. Lean cuts were priced 80 percent above live hogs, fat 39 percent less than live hogs, on a pound-for-pound basis.

Exports were an important factor in the strong position of lard before 1920. Figure 4 gives the lard production and export picture since 1900. During the first 20 years of the century, we exported about a third of the lard we produced. After the early years of the twenties, exports and production began to pull away from each other until exports reached a rather low level in the late 1930's. During World War II and after, we recovered some of the foreign market for lard.

While foreign demand for lard was declining, the lard price situation since the 1920's also became substantially weaker on the domestic side. Lard is only one of a sizable complex of fats and oils that are to varying degrees competitive with each other. Expansion of U. S. production and exports of soybeans, source of our most important vegetable oil, is indicated in figure 5. Soybean production has expanded to about 25 times the 1930 level. In the last few years, this country has been processing more soybean oil than lard. Soybean oil is an important ingredient both of vegetable-oil shortening and of margarine. A bushel of soybeans yields about 10 pounds of soybean oil.

The changing price ratios between lard and fat on the one hand, and the leaner cuts of pork on the other, have called for a change in the production of the relative proportions of pork and lard in our country. Nevertheless, figure 6 shows that we are now producing almost the same proportion of lard--about 1 pound of lard for 4 pounds of pork--as we did at the beginning of the century. There has been no obvious response to the retail and wholesale price signals that have been calling for changes in hog type.

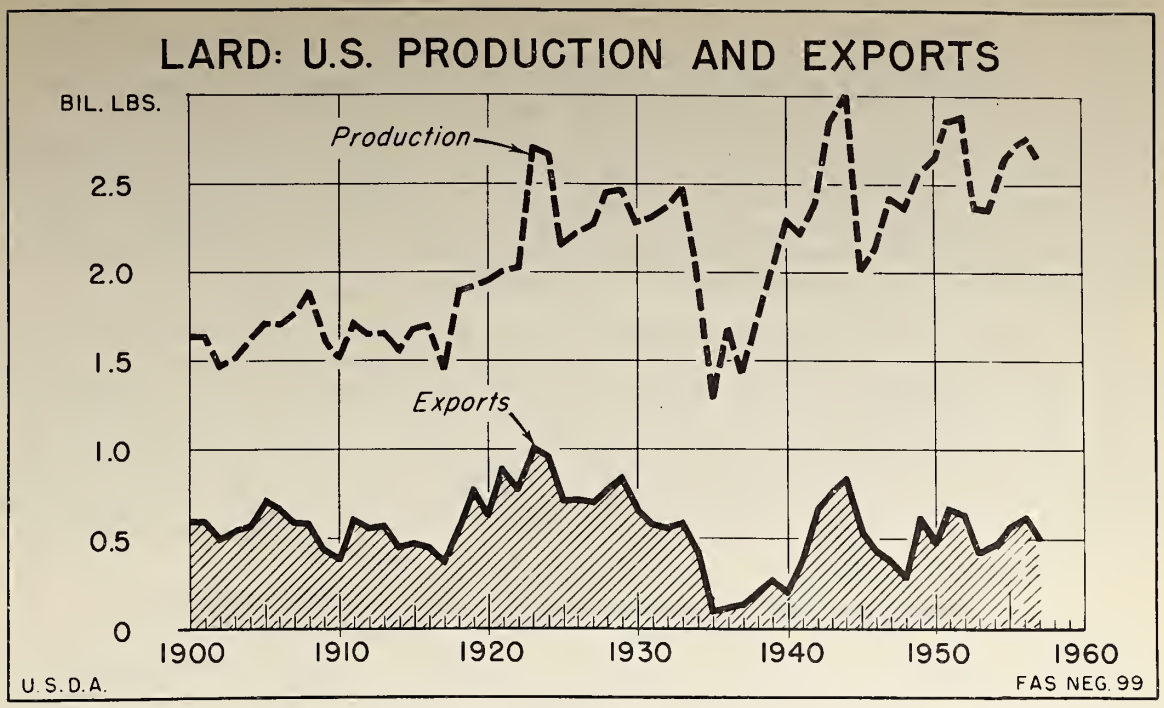


Figure 4.

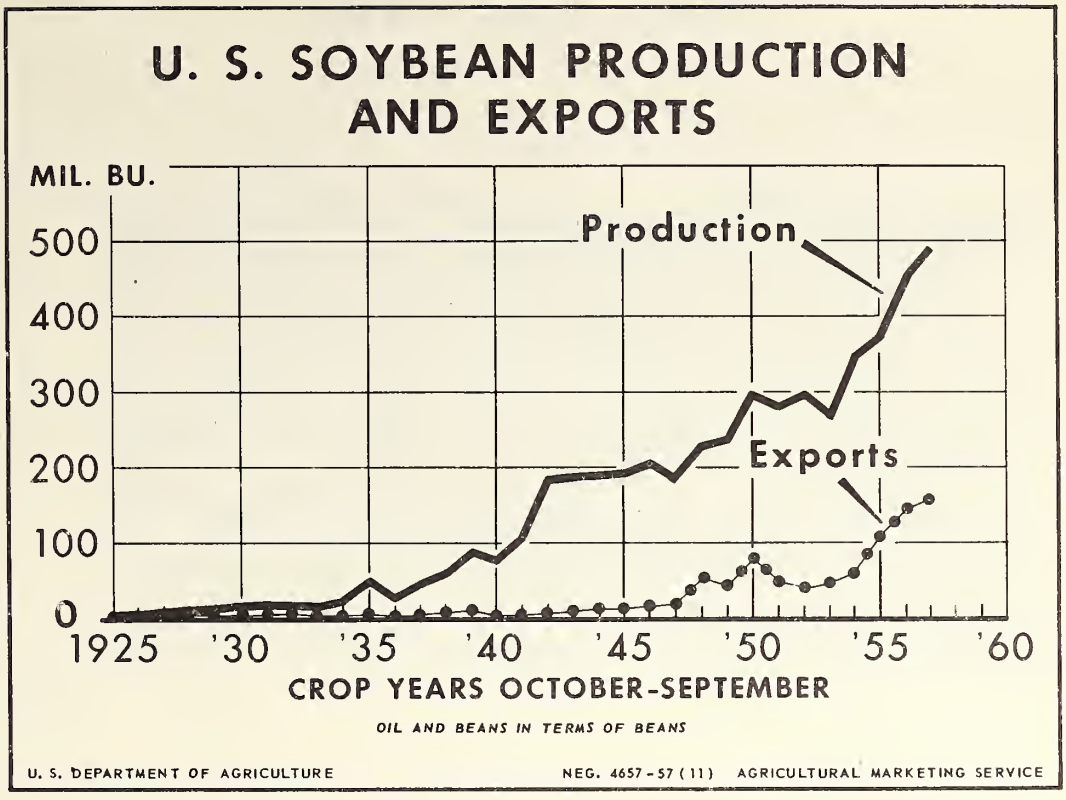


Figure 5.

This does not mean that hog type has not been improved during this period. In the first place, average market weights have changed. Weights of hogs, including sows, slaughtered under Federal inspection averaged around 225 pounds in the early 1920's. They were up to almost 250 pounds in the late 1940's, and they averaged a little over 240 pounds in recent years. Higher yields of lard, typical of heavier hogs, may have partially offset results of changes in the type of hogs produced. Another reason for larger yields of lard in recent years is the fact that a larger share of fatback and other fat pieces could not be sold at retail and have had to be converted to lard. A third reason may be that packers have had to trim their product more closely in order to merchandise pork cuts successfully to retailers and eventually to homemakers.

Each of these factors may have partially offset the effects of recent trends toward meatier type strains and breeds of hogs. Despite the efforts to breed meatier hogs, the fact is we are still producing lard and pork in about the same proportions to each other as we did at the beginning of the century, even though consumers have demonstrated rather emphatically in the market place that they want more lean pork and less lard. The graphs indicate that the price signals have carried back to the wholesale level. But apparently they have not been effectively transmitted back to farmers on a broad enough scale in terms of an effective price differential between meatier hogs and fatter hogs.

Less Consumer Demand for Pork Relative to Other Meats

Other price and demand signals have had more ominous implications for hog producers in recent decades. They suggest that the demand for pork has been declining, especially with respect to that for competing meats.

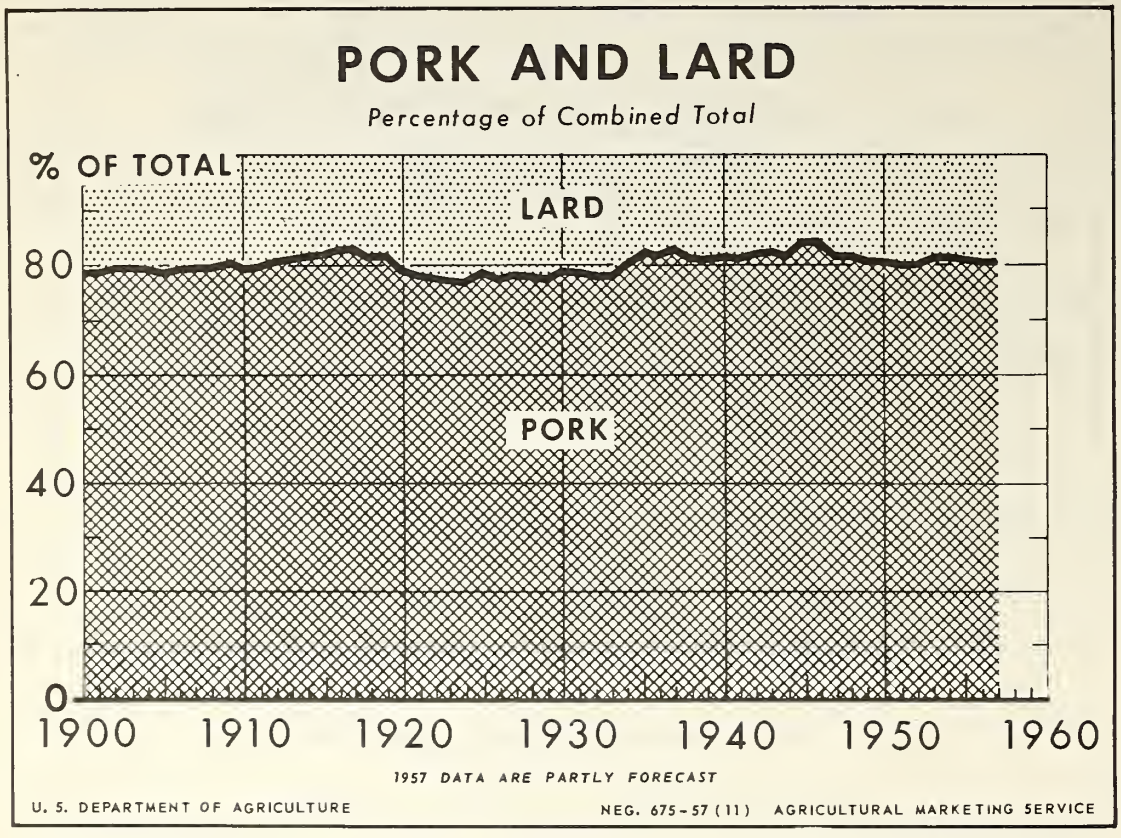


Figure 6.

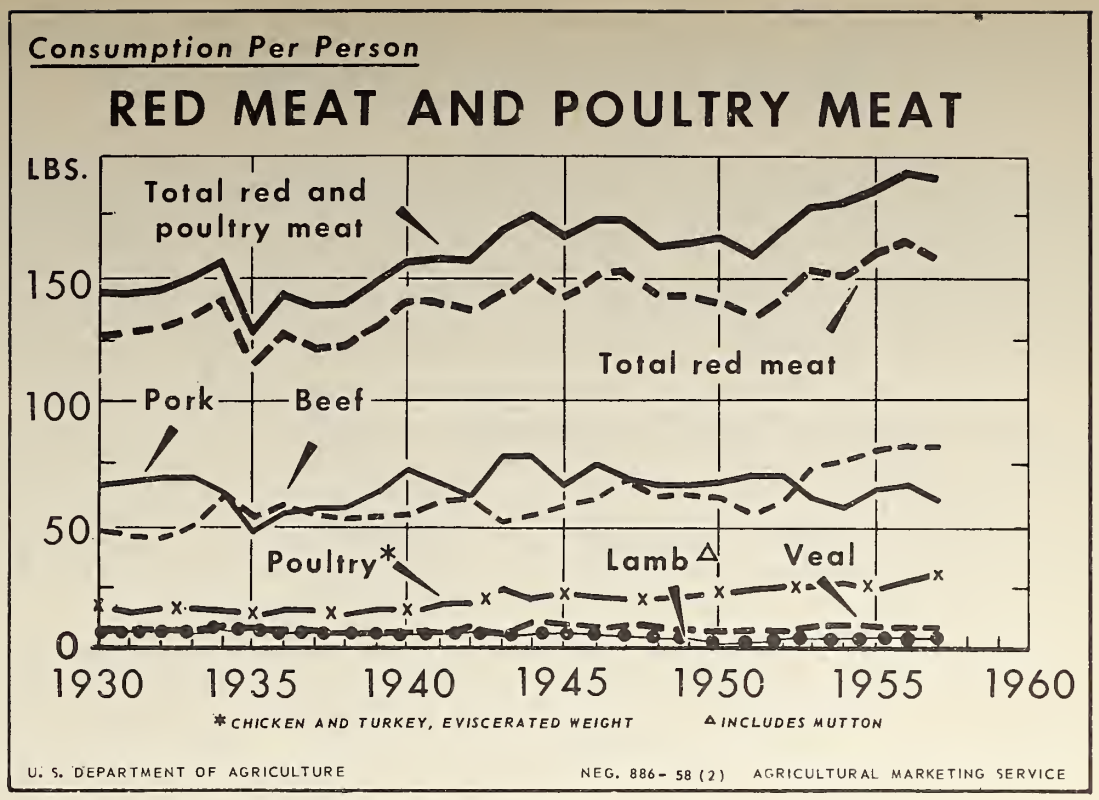


Figure 7.

The increasing production and consumption of meats that compete with pork are shown in figure 7. Per capita consumption of beef increased from 56 pounds in 1951 to an alltime high of over 85 pounds in 1956 and nearly 85 pounds in 1957. Beef and veal consumption combined increased from about 63 pounds per capita in 1951 to about 95 pounds in 1956, an increase of over 50 percent in 5 years. Consumption of all red meats was at a 10-year low of 138 pounds per capita in 1951, but increased to 166 pounds in 1956.

Pork consumption, however, has not shared in this increase. Pork consumption per capita has been about equal to prewar averages, while beef consumption was almost 1/2 higher in 1957.

Per capita consumption of poultry meat also has increased substantially in the last 15 years. During the 1930's, poultry meat consumption averaged somewhat more than 15 pounds on the ready-to-cook basis. In 1940, poultry consumption stood at about 17 pounds per capita, by 1950 it had risen to nearly 25 pounds, and by 1957 to about 31 pounds.

Although meat consumption per capita has been increasing in recent years, consumer expenditures for meat have not kept pace with consumer incomes (fig. 8). Consumers spent a little more than 6 percent of their incomes on meat during the 1920's and through most of the 1930's. During World War II, when incomes expanded rapidly but expenditures and prices were restrained, the percentage expenditures for meat dropped sharply. At the end of the war, with the removal of controls, expenditures for meat climbed sharply to about 6.9 percent in 1947. By 1949, the figure was down to prewar levels at 6.1. By 1956, however, the percentage of consumer incomes spent for meat had dropped to 5.0 percent.

For hog producers, an even more critical situation stems from the indications that pork has been gradually losing ground in relation to beef in the consumer's favor. This

change in the purchase of pork is reflected in the change in retail prices for pork as compared with beef. Figure 9 shows that the path of the pork-beef retail price ratio (pork prices expressed as a percentage of choice beef prices) is somewhat irregular, but over the long sweep of the last 40 years, it has shown a general downward trend.

This shift also shows up in figure 10. Although expenditures for both beef and pork have fluctuated over the past 40 years, the percentage of income spent for beef has maintained a more nearly level trend, while the portion spent for pork has tended downward. Consumers spent more of their budget for pork than for beef up to 1949. In the 1920's, consumers averaged about 2.3 percent of their total income spent on beef and about 3.4 percent on pork. Since 1947, expenditures for pork have dropped from about 3.3 percent of consumer income to 2.0 percent in 1957. Total expenditure for beef during this later period, however, has remained relatively stable at about 2 3/4 percent of consumer income.

Still another comparison is one showing consumer expenditures for pork compared to expenditures for beef and veal (fig. 11). The spurt in expenditures for pork during the war took place because we were able to expand our hog production greatly at that time, and the pork was readily consumed because of the shortage of beef at ceiling prices. Expenditures for pork were nearly 140 percent of the beef and veal expenditures in 1943. After the war, the previous relative decline for pork was resumed and by 1957 pork expenditures had dropped to 67 percent of beef and veal expenditures.

Several factors may have had a bearing on this shift in consumer purchases. Urban people on the average eat more beef and less pork than farm people, and our population had become more urbanized. Even rural people have developed more urbanized tastes with the increased use of frozen food lockers and home freezers. Higher income groups tend to consume more beef than pork. Rising incomes since the war may account for part

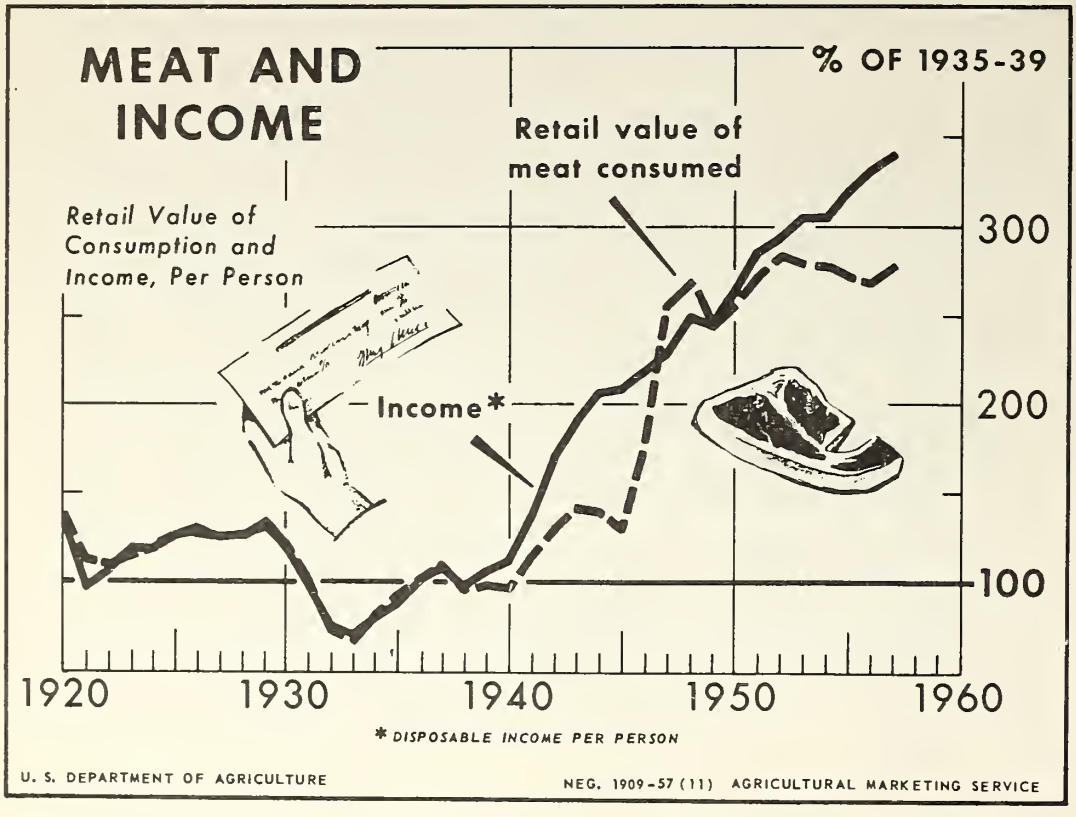
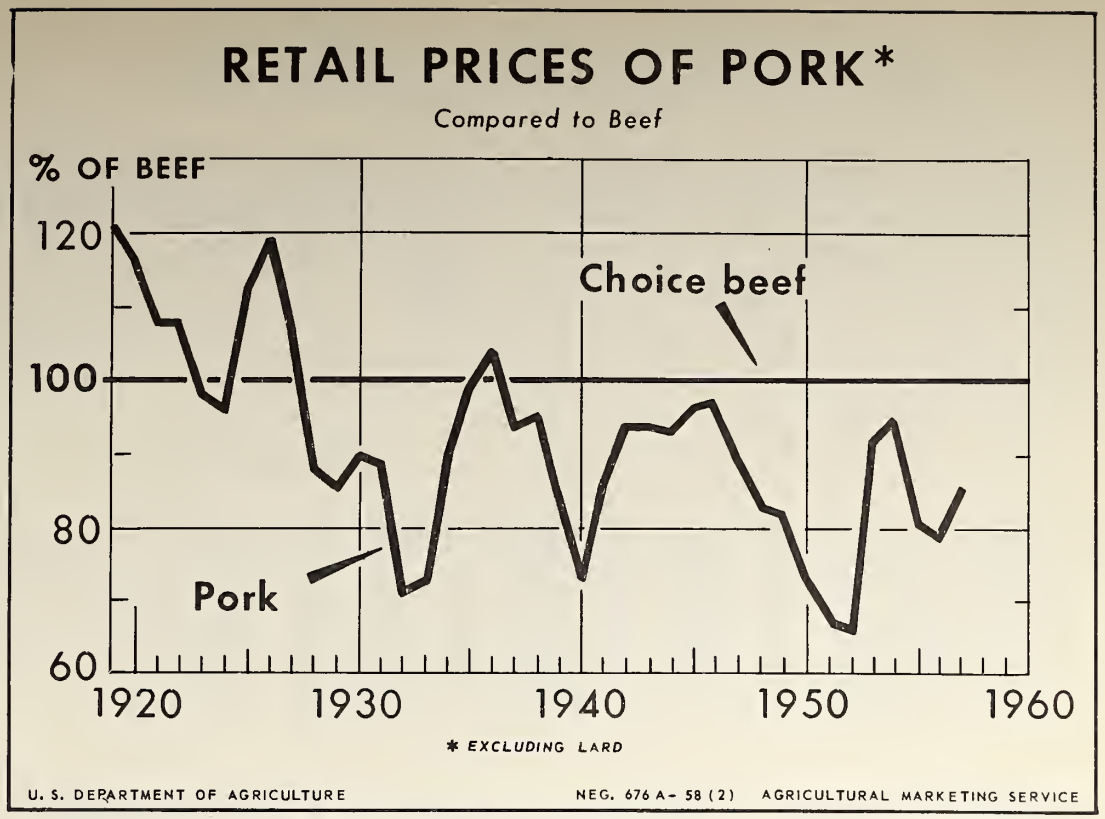


Figure 8.



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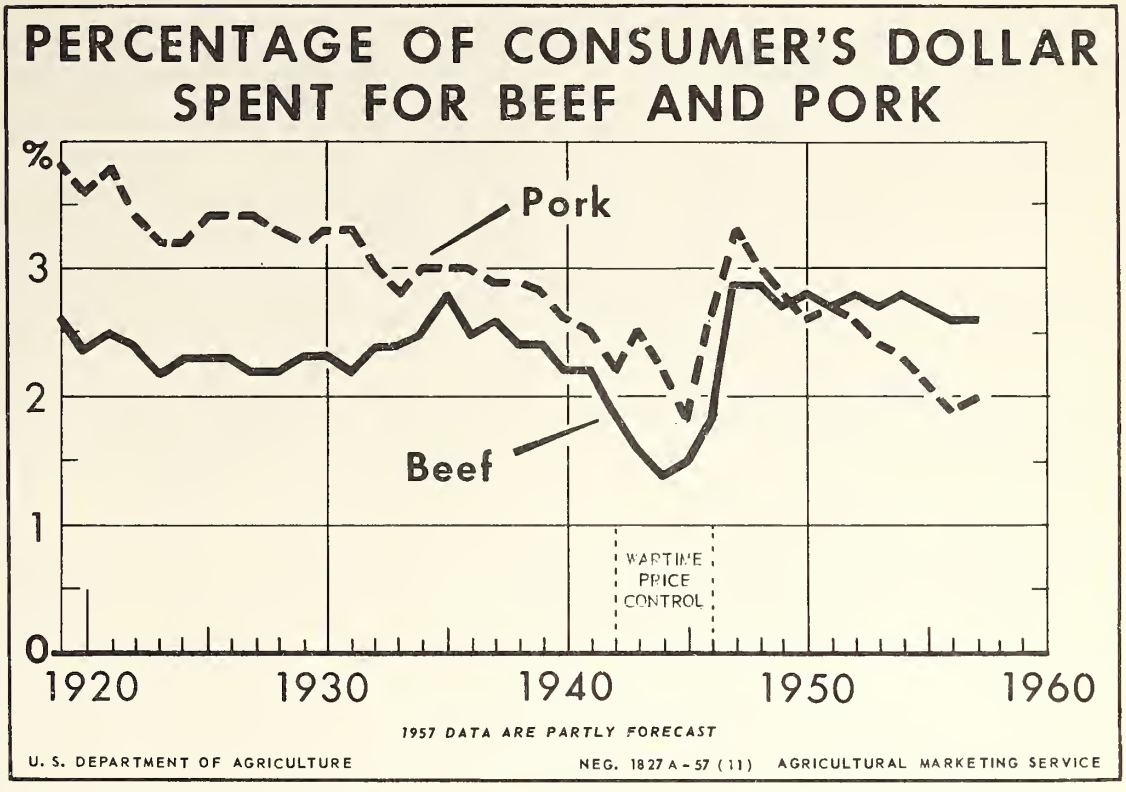


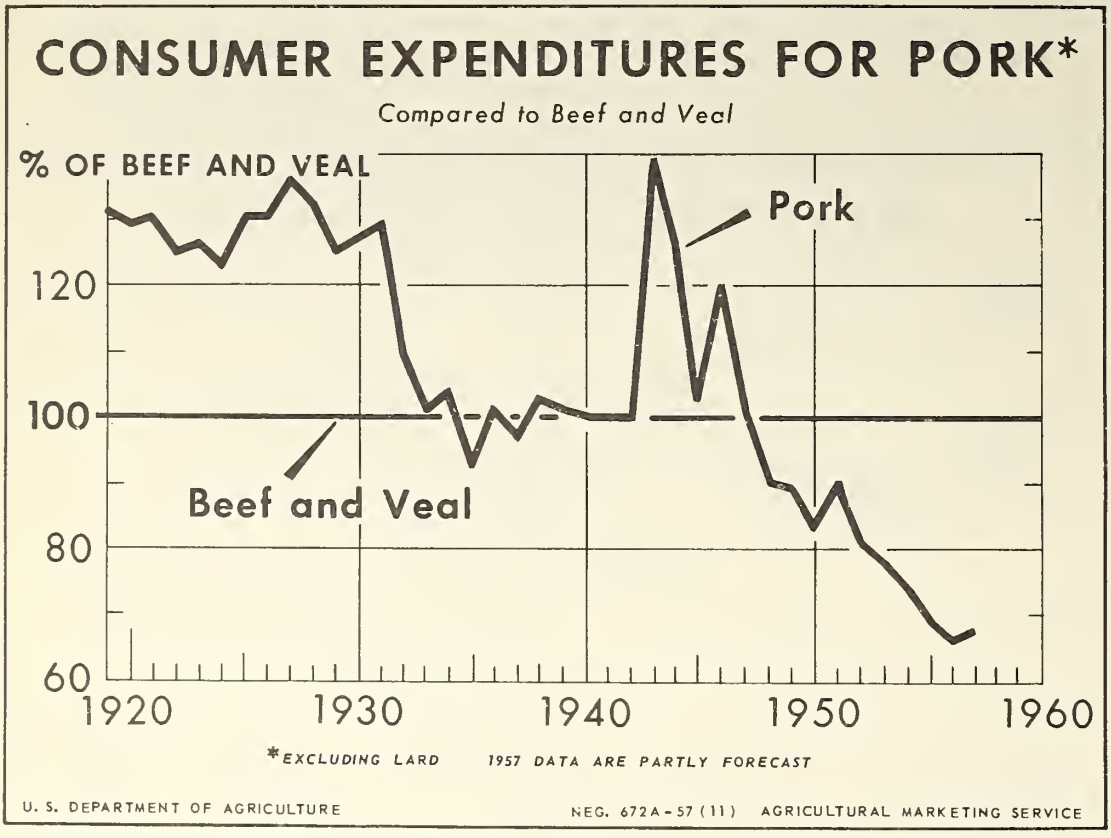
Figure 10.

of the weakened competitive position of pork since 1947. Another point which should not be overlooked is the shift of demand away from pork cuts that carry excess fat, as indicated by the prolonged decline in the prices of fat cuts of pork relative to prices of lean cuts. This has been a persistent change over a long time.

Increasing consumption of red meat per capita since the war is largely attributable to increases in beef consumption. Production of hogs in recent years has not kept pace with population growth (fig. 12). While population has been growing about 1 3/4 percent per year since World War II, hog production has increased only about 1/2 of 1 percent per year. For the last few years, pig crops have averaged around 90 million head per year. If hog production had kept up with the increase in human population, pig crops now would be averaging in the neighborhood of 100 million per year. This is an indication of the extent to which hog production has been held back as a result of the declining per-capita demand for pork since World War II.

Pricing Hogs by Grade in the United States

Less demand for lard, and to some extent the declining demand for pork, especially the fatter cuts, have had their impact on the swine industry in terms of both lowered prices and reduced production. Prices have been generally depressed on all hogs, rather than on the fatter animals which contribute most to the problem. Price signals calling for the production of leaner hogs have not reached to farmers in terms of an effective price differential between the more valuable hogs with a high proportion of lean cuts and the less valuable hogs producing a higher proportion of lard.



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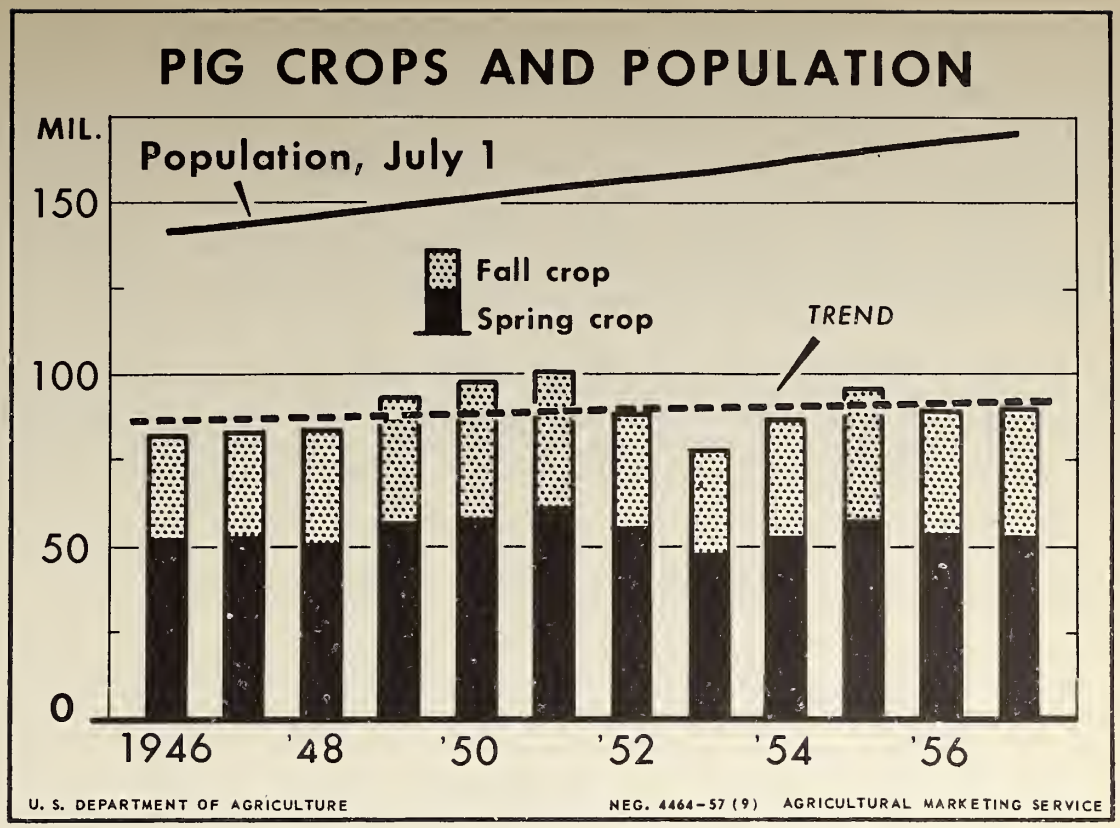


Figure 12.

One of the earlier problems in selling hogs according to their value was that of adequate grade standards. Before World War II, one packer experimented at various times with the carcass weight and grade method of sale. These experiments were discontinued, however, because it was believed that grade standards at that time were not adequate.

Based largely on data obtained under commercial conditions in research work initiated by the University of Minnesota in 1946, adequate carcass grade standards have been developed by the United States Department of Agriculture. These standards differentiate hogs or carcasses into grades having different proportions of lean cuts relative to lard, and differences in the quality of pork produced. Based on Department analyses of these research data, tentative grade standards were proposed by the United States Department of Agriculture in 1949. With minor changes, they were adopted as official standards in 1952. These standards depend primarily on average backfat thickness to differentiate hog carcasses according to yield and value. Different backfat thickness specifications are established for different weights of carcasses. Live hog grades are an estimate of the expected carcass grades after slaughter. The official standards were revised in 1955, reducing the average backfat specifications for each of the major grades by 2/10 of an inch.

The relationships of average backfat thickness to yields of various pork cuts is illustrated in figure 13. These relationships were reported in the 1946 study mentioned above. The lean cuts--the hams, loins, picnics, and Boston butts--all tend to yield higher on carcasses carrying less backfat. The trimmable fat which goes into lard, of course, is a higher percentage of the total carcass on hogs with greater backfat thickness.

Although tentative grade standards have been available for market hogs since 1949 in this country, and official standards since 1952, only a relatively small percentage of the hogs marketed in this country are bought by grade. In one Corn Belt State, it has been estimated that as many as 8 to 10 percent of the hogs are sorted according to grade

before they are sold. This percentage, however, would probably be considerably lower for the entire country. Some hog buyers at terminal markets, as well as at country points, pay some differential according to the percentage of No. 1 grade hogs in the lot. By this method, an attempt is made to price hogs more nearly at their actual value, but there is less educational value to the producer, since he does not know how his individual hogs actually graded. Nor does he receive a different price for each of the different grades of hogs that he sells.

Several packers in the Middle West offer to farmers the alternative of selling their hogs on what is called the "grade and yield" basis, which is essentially a carcass weight and grade system. In Canada, this practice is called "the rail grade system."

One of the circumstances that may partially explain the slowness with which the marketing of hogs by grade has developed in the United States is the fact that the value differentials between grades have been relatively small. Table 1 shows the yield of cuts of representative carcasses for each of the 3 major grades, average wholesale prices for 1957, carcass values. and live hog values. Yields for No. 1 carcasses were com-

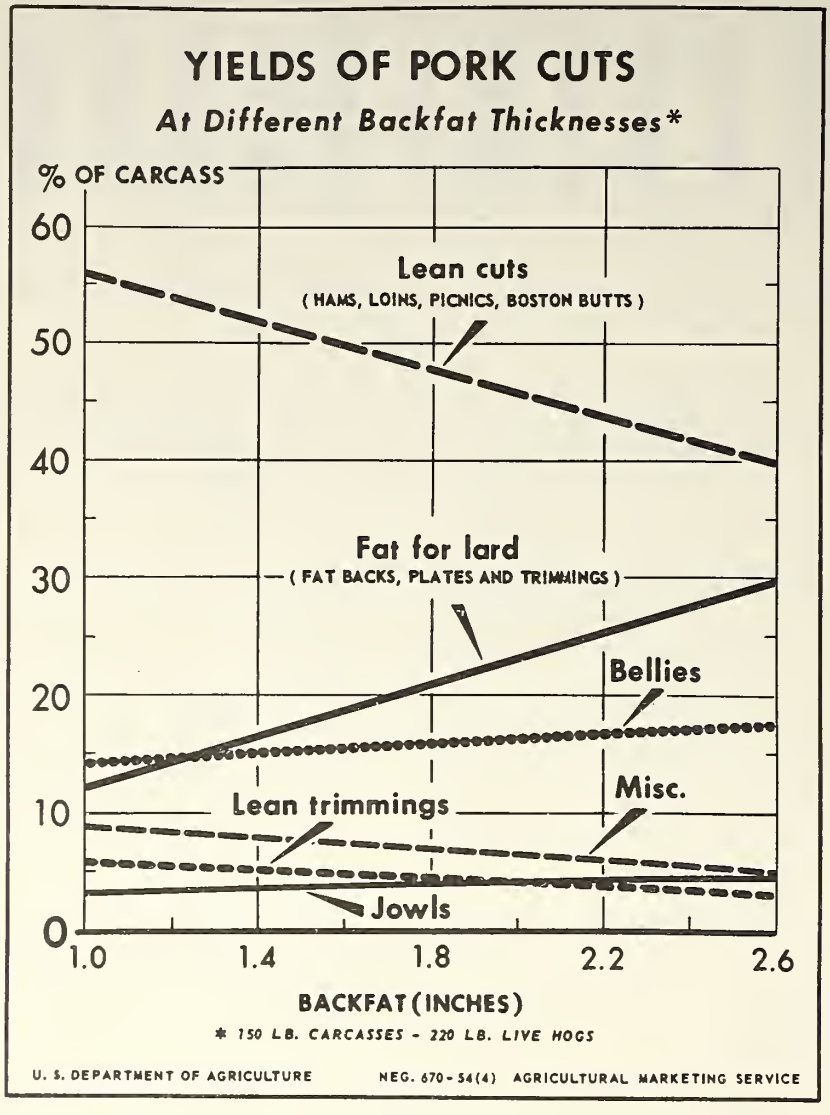


Figure 13.

TABLE 1.--Carcass cutting and value yields for different grades of hogs at 220 pounds liveweight, and wholesale prices at Chicago, 1957[1]

Wholesale cut	Average price[2]	U. S. No. 1		U. S. No. 2		U. S. No. 3	
		Percentage yield, carcass basis	Value	Percentage yield, carcass basis	Value	Percentage yield, carcass basis	Value
Four lean cuts:							
Skinned hams, 12-14 lbs	*Dollars* 42.83	*Percent* 19.4	*Dollars* 8.31	*Percent* 18.2	*Dollars* 7.79	*Percent* 17.0	*Dollars* 7.28
Loins, 10-12 lbs.	43.39	14.7	6.38	13.9	6.03	13.1	5.68
Picnics, 6-8 lbs.	24.26	9.9	2.40	9.4	2.28	8.9	2.16
Boston butts	34.03	8.0	2.72	7.5	2.55	7.0	2.38
Subtotal, four lean cuts		52.0		49.0		46.0	
Bellies, square cut, 10-12 lbs	34.07	15.0	5.11	15.6	5.32	16.2	5.52
Pork trim, 50 percent lean	21.09	5.0	1.06	4.5	.95	4.0	.84
Jowl butts	14.36	3.5	.50	3.8	.54	4.1	.58
Spareribs - 3 lbs. down	38.07	2.5	.95	2.3	.87	2.1	.79
Neck bones	9.74	2.0	.19	1.8	.17	1.6	.15
Feet	2.62	3.1	.08	2.8	.07	2.5	.06
Tails	11.75	0.2	.02	.2	.02	.2	.02
Fat for lard	10.05	16.7	1.68	20.0	2.01	23.3	2.34
Value per 100 pounds carcass weight			29.40		28.60		27.80
Dressing percentage		67.5		68.0		68.5	
Value per 100 pounds liveweight			19.84		19.44		19.04

[1] Carcass yields of 220-pound hogs with dressing percentages of 67.5, 68.0, and 68.5 percent, respectively and average backfat thickness of 1.4, 1.7, and 2.0 inches, respectively. Cutting yields are developed from research data reported in "Marketing Slaughter Hogs by Carcass Weight and Grade," Gerald Engelman, A. A. Dowell, E. F. Ferrin, and P. A. Anderson, Minn. Agr. Exp. Sta. Tech. Bul. 187, April 1950.

[2] Fresh carlot wholesale prices at Chicago from the National Provisioner, December 1956 through November 1957. Price of fat for lard - 80 percent of price for prime steam lard, loose. (Average lard yield of fat cuts is approximately 80 percent.)

puted for carcasses having backfat thicknesses of 1.4 inches; for grade No. 2, 1.7 inches; and for grade No. 3, 2.0 inches. According to this table, each additional 1/10 inch of backfat thickness reduces the yield of high-value lean cuts by 1 percent. Each additional 1/10 inch of backfat thickness increases the yield of fat by 1.1 percent.

The typical U. S. No. 1 carcass from this weight of hog has approximately 3 percent more of the valuable 4 lean cuts (hams, loins, picnics, and Boston butts) than the U. S. No. 2 carcass (table 1). It has approximately 6 percent more than the U. S. No. 3

carcass. Most of this advantage is in the two most valuable cuts, hams and loins. As a percentage of the carcass, one of the cuts with above-average value, bellies, tends to go down as grade improves. However, this is more than offset by the increase in yield of four lean cuts, as shown by the total carcass value per hundredweight.

Average carcass value differentials between grades were about 80 cents per 100 pounds of carcass weight during 1957. In terms of live-hog value, the differentials between grades were equivalent to about 40 cents per hundredweight. Live-hog value differentials tend to be reduced below carcass value differentials because, on the average, the fatter hogs have a higher dressing percentage or carcass yield in addition to the lower per-pound value of the live hog.

These cutting yields are based on a study made at a Minnesota packing plant some years ago. Cutting methods vary from packing plant to packing plant. They are also changed from time to time as relative prices of the various cuts change. At the time this study was undertaken, it was believed that this packing plant trimmed the excess fat from its lean cuts more closely than did the average packing firm at that time. This closer trim would result in wider differences in yields of lean cuts between grades. Since that time, however, industry practice in trimming pork cuts may have been changed in the direction of closer trim.

In calculating the value differentials for table 1, the same prices were applied to cuts from carcasses of grades No. 1, No. 2, and No. 3, although cuts from the No. 3 carcasses usually carry more intermuscular fat than cuts from the No. 1 grade carcasses. If price differentials could be generated and relayed to the wholesale level for cuts from different grades of carcasses, price differentials could be widened at the carcass and live-hog levels. For example, if loins and hams from No. 1 carcasses could be sold for 5 cents a pound more than loins and hams from the No. 2 carcasses, the value difference per 100 pounds between grades would be increased from 80 cents to $2.50 on carcasses and from 40 cents to $1.55 on live hogs. Consumer preference studies conducted to date, however, have not yet demonstrated whether or not such a differential could be obtained at the retail level.

Another method of obtaining wider value differentials would be the adoption of processing methods which result in higher degrees of trimming and defatting, and perhaps boning, of the present lean cuts. Such methods would increase the difference in yields of lean cuts between grades and would widen value differentials.

Wider price differentials between grades are justified also when wholesale price differences between lean cuts and lard are wider.

One of the problems which handicaps the selling of hogs by grade in this country has been a rather common practice of using "straight" buying to obtain a trading advantage in the procurement of hogs. Even under weight-bracket pricing, when no attention whatever was paid to grade, tolerant sorting of weights was sometimes used as a competitive device against other buyers. When the differential between 200-220-pound hogs and 220-240-pound hogs is rather substantial, a buyer might take the entire lot at the 200-220-pound price if the lot averaged 219 pounds or less, even though it includes a number of hogs weighing over 220 pounds.

One of the most important decisions affecting the profit or loss position of hog slaughterers and pork processors is the weekly decision on volume of slaughter to be handled by any given plant. When this decision is made, each buyer is allocated a certain portion of that volume. The individual packer-buyer who negotiates with farmers is much like a foot soldier in a lonely outpost of his firm's procurement system, surrounded by similar outposts of other competitive packers. In this situation, tolerant sorting with respect to either weight or grade becomes a competitive trading device. Both packer and independent hog buyer are under pressure from sellers to use a more tolerant sort.

One buyer cannot afford to see a competitor take his business away by making more tolerant sorts. Thus, in the normal hog procurement activities of packers, there exist rather powerful tendencies toward generalizing prices.

On terminal markets, some commission men believe that selling the whole lot "straight" brings a higher net price than selling them sorted. On the other hand, packer-buyers on terminal markets complain because commission sellers will not sort hogs according to grade. Some packers who have announced definite policies of buying all hogs on a grade basis have reported that their volume of business suffered thereafter.

Several other factors handicap the sale of hogs by grade. Packers offering the carcass system of pricing use differing standard dressing percentages or carcass yields as conversion factors from the live-weight base price to an equivalent carcass price. The function of yield and its implications on returns, when hogs are bought on the carcass system with the price established from a live-weight price base, are not well understood by farmers. Most grade standards used by packers are based on the same general relationship between backfat thickness and the yield of lean cuts as the official U. S. grade standards. Nevertheless, many packers use their own standards, having a different number of grades and different points of separation between grades. Differing "standard" yields and differing grade standards make it more difficult for farmers to compare intelligently the offers of different packers each of whom may be attempting to buy by grade

With relatively narrow price differentials between grades, if any at all, with a variety of systems of buying hogs by grade, and with these systems often inadequately and ineffectively applied, progress toward the production and marketing of meat-type hogs has been relatively slow in this country. Because of these limitations, the free-market pricing system has not been as fully effective as it might be in carrying the changing preferences of consumers back to hog producers.

SWINE IMPROVEMENT IN CANADA

A strip less than 200 miles wide along Canada's southern border contains the greater part of her agricultural land. This land is divided by an extensive barren region which reaches from western Ontario eastward over most of the northern border of Minnesota and the north shores of Lake Superior and Lake Huron. This expanse of wasteland along Canada's southern border, geologically known as the Pre-Cambrian Shield, extends a distance nearly equal to that from Nebraska to Pennsylvania. The barren land presents a substantial barrier to the shipment of feed grain and of livestock products from the grain-surplus areas of the West to the grain-deficit areas of eastern Canada. Although the eastward shipment of grain across this wasteland is subsidized by the government, agricultural production on either side of the barrier is, nevertheless, profoundly affected by it.

Agricultural areas of Canada and the northern United States are indicated in figure 14 by crosshatching. Both Canada's swine and human populations approximate one-tenth those of the United States (table 2). The Province of Ontario in eastern Canada produces about one-third of Canada's total hog supply. Eastern Canada produces about three-fifths of the total hog production, while western Canada accounts for the remaining two-fifths.

Barley and oats are the principal grain concentrates fed to hogs in Canada. Protein supplements in a balanced ration are more common in eastern Canada, where grain concentrates are relatively more dear. Hog producers in eastern Canada buy much of their grain from western Canada and convert it into pork. Under these circumstances, grain represents an out-of-pocket expense to eastern producers who, therefore, have a greater incentive to use it efficiently. A high percentage of this feed is bought in the form of a prepared balanced ration. In the grain-surplus prairie (western) provinces, however, it is more common for hogs to be raised without protein supplements and to require perhaps 7 or 8 months to reach market weight.

TABLE 2.--Human population by province and livestock on farms by species and by province in Canada; human and livestock populations in the United States

Area	Human population[1]	Hogs[2]	Cattle and calves[2]	Sheep and lambs[2]
	Thousands	*Thousand head*	*Thousand head*	*Thousand head*
British Columbia	1,487	45	335	50
Alberta	1,160	1,435	2,020	385
Saskatchewan	879	562	1,370	107
Manitoba	860	307	665	36
Ontario	5,622	1,900	3,127	274
Quebec	4,758	1,151	1,840	205
New Brunswick	565	62	180	39
Nova Scotia	702	34	187	55
Prince Edward Island	99	54	119	21
Canada (total)	[3] 16,589	[4] 5,550	[4] 9,843	[4] 1,172
United States	170,981	52,207	95,166	26,370

[1] As of June 1, 1957. Dominion Bureau of Statistics. U. S. Census.
[2] Livestock on farms in Canada as of December 1, 1956. Livestock on farms in U. S. as of January 1, 1957.
[3] Includes Newfoundland, Yukon, and Northwest Territory.
[4] Newfoundland, Yukon, and Northwest Territory are not shown. Annual estimates of livestock on farms not made in these areas.

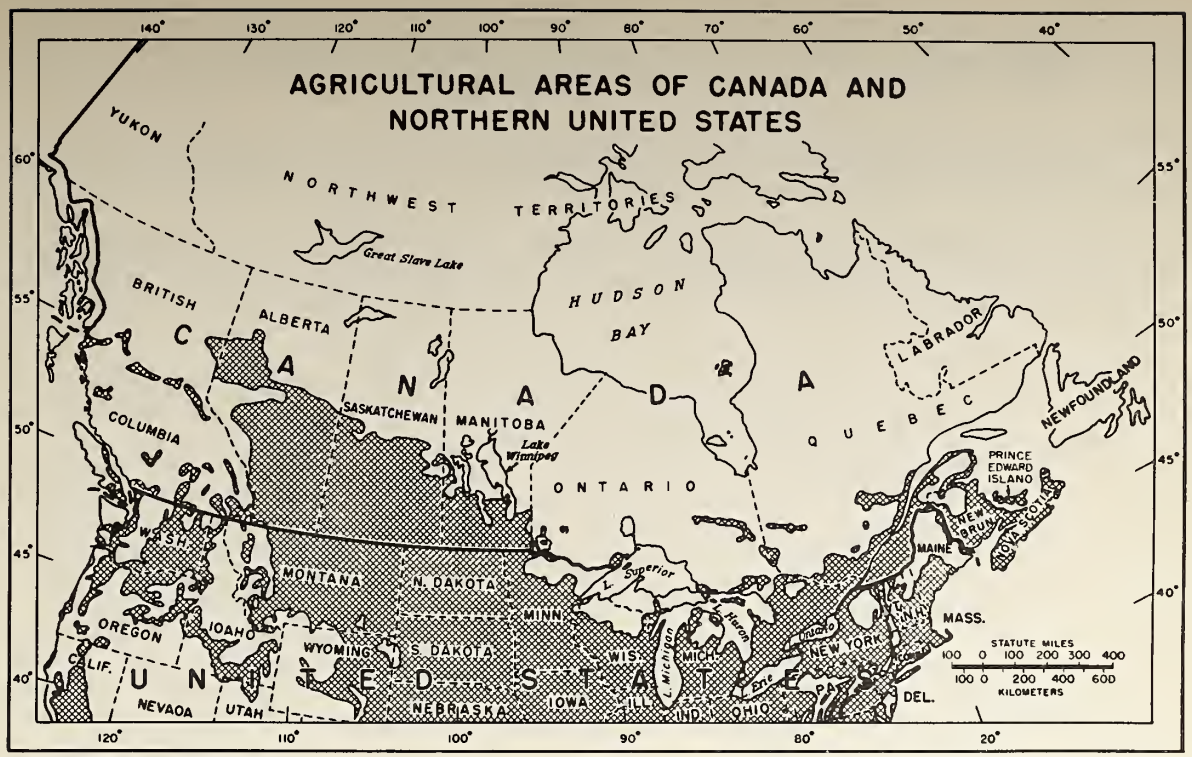
The Canadian Wheat Board, a government monopoly, is the only legal buyer of small grains for shipment out of the prairie provinces. The Board can buy only that part of a farmer's crop covered by his marketing quota. The remainder is unsalable through regular commercial channels. Since 1941, a combination of high crop yields and low marketing quotas for grain has often deprived the prairie province farmers of an immediate market outlet for a substantial portion of their grain. When marketing quotas are low, pressures are placed on farmers to convert their so-called "free wheat," not salable through regular channels, into livestock. This seems to have had rather serious effects upon the quality level of hogs produced in western Canada at various times.

In the grain-deficit farming area of eastern Canada, all grains are traded on the open market. Marketing quotas do not apply in eastern Canada and the Canadian Wheat Board does not operate there as a buyer of grain.

Swine production is largely a sideline enterprise on most Canadian farms, although commercial-scale feeding is increasing in importance. Most pigs come from herds of from 2 to 6 brood sows. The level of hog production can be abruptly altered by changes in hog prices or feed prices, as in the United States. However, because hog production is a sideline enterprise for most Canadian farmers, changes in overall farm income also affect the number of sows that producers keep for farrowing. When income from the main enterprises on a farm is low, hog production may be expanded in an attempt to bolster the sagging income.

The Market for Canadian Pork

The market for Canadian pork is tied rather closely to the market for pork in the United States. Figure 15 shows that prices received by farmers at Toronto for hogs have followed the same general path as prices received by farmers at Chicago. Exceptions



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"Crosshatching indicates Agricultural Areas"

Figure 14.

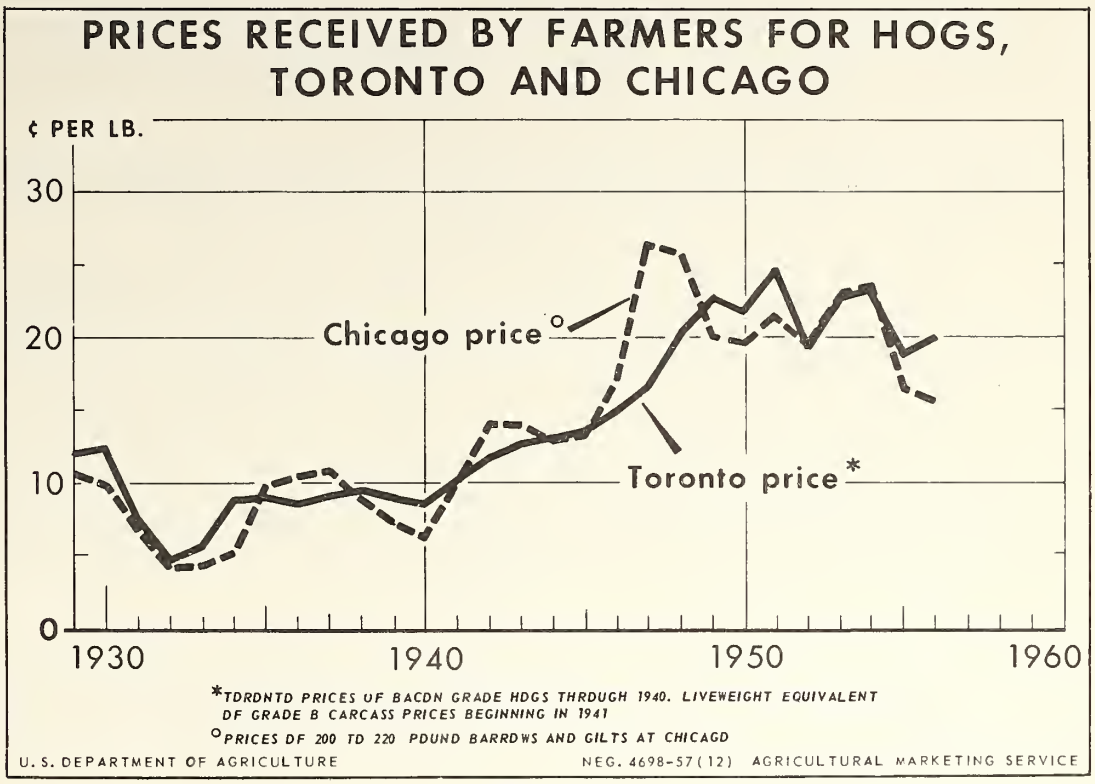
PRICES RECEIVED BY FARMERS FOR HOGS, TORONTO AND CHICAGO
¢ PER LB.
30
20
10
0
Chicago price °
Toronto price *
1930
1940
1950
1960
*TDRDNTD PRICES UF BACDN GRADE HDGS THRDUGH 1940. LIVEWEIGHT EQUIVALENT DF GRADE B CARCASS PRICES BEGINNING IN 1941
°PRICES DF 200 TD 220 PDUND BARRDWS AND GILTS AT CHICAGD
U. S. DEPARTMENT OF AGRICULTURE
NEG. 4698-57(12) AGRICULTURAL MARKETING SERVICE

Figure 15.

are the 1946-47 period when U. S. hog prices advanced sharply with the removal of price controls, and the recent period of embargo of imports of U. S. pork into Canada as a result of outbreaks of vesicular exanthema in the United States.

Canadian consumption patterns for beef, pork, lamb, veal, and poultry are quite similar to the patterns in the United States, although the overall consumption per capita is somewhat lower for all meats than in the United States.

Until recently, Canada has depended to a greater extent upon export outlets for her pork production than has the United States (fig. 16). In examining this graph, it must be remembered that Canadian pork production is on a much smaller base than that in the United States.[2]

The threat of losing her British market to Denmark was responsible for Canada's major efforts, beginning in the 1920's to improve the quality of her pork. Canada obtained a preferential contract to supply Wiltshire sides to Great Britain in 1930. The Wiltshire side was the main form in which Great Britain imported pork. It consisted of a half carcass, with only the head, feet, aitchbone, backbone, breastbone and neck removed. By 1939, Canada's pork (Wiltshire side) was of such a quality that it was receiving almost as high a price on the British market as was pork from Denmark. Denmark has been the leading British supplier and, except for the years of her occupation during World War II, a leading producer of high-quality pork. Canada's preferential treatment by Great Britain ended in 1950, by mutual agreement, as Denmark had reconstructed her swine industry after the war and had begun to undersell Canada. The effect of the loss of Canada's export market has been partially offset by growing domestic demands as Canadian population and income have increased. Both Canadian and United States pork outlets have now become primarily domestic.

The History of Swine Improvement in Canada

After World War I, Canadian pork products were losing ground to European suppliers in the United Kingdom market, leaving Canada with a surplus of hogs. The Canadian hog population consisted of a high proportion of short, thick, fat animals, and the lean, bacon-type hog was relatively scarce. "Hogs were bought and sold on a flat basis (regardless of quality) ... On public markets, they were stuffed with feed and water before weighing up for sale to gain back the weight lost in shipment."[3]

Danish bacon--the Danish Wiltshire side--was extremely favored throughout the United Kingdom. Competition with Denmark in the British market for Wiltshire sides dramatized the need for swine improvement in Canada in the early 1920's.

In the fall of 1921, a conference of producers, packers, and agricultural officials, held in Ottawa, established a Joint Swine Committee. This committee was organized to find ways in which the various interests could work together to maintain their position in the very important British market, the loss of which would have required drastic curtailment of swine production on farms, as well as of slaughtering operations. The Federal Department of Agriculture was requested by the committee to establish a hog-grading system. Grading of live hogs was actually initiated in the fall of 1922. In the fall of 1927, packers undertook to make all hog purchases on a grade basis, paying premiums for the top quality hogs. In March 1928, hog grading was made compulsory in the Province of Ontario, the largest swine-producing province in Canada. During February 1931, the Joint Swine Committee recommended that consideration be given to: (1) Compulsory settlement for all hogs on the basis of official grading, and (2) a system for carcass

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[2] In 1919, Canada's pork exports totaled roughly three-fourths of her production for commercial slaughter. By 1923 the export share had fallen to less than one-third. The 1944 export peak (fig. 16) represented 49 percent of a total 1,463-million-pound production for commercial slaughter in Canada. In 1946, Canada's pork production was only half the 1944 output. In recent years, output has settled to a figure of about 900 million pounds in Canada (it has been 14,000 million pounds in the United States).

[3] Maybee, H. J., "Hog Grading in Canada," Pub. 961, Canada Dept. Agr., December 1955.

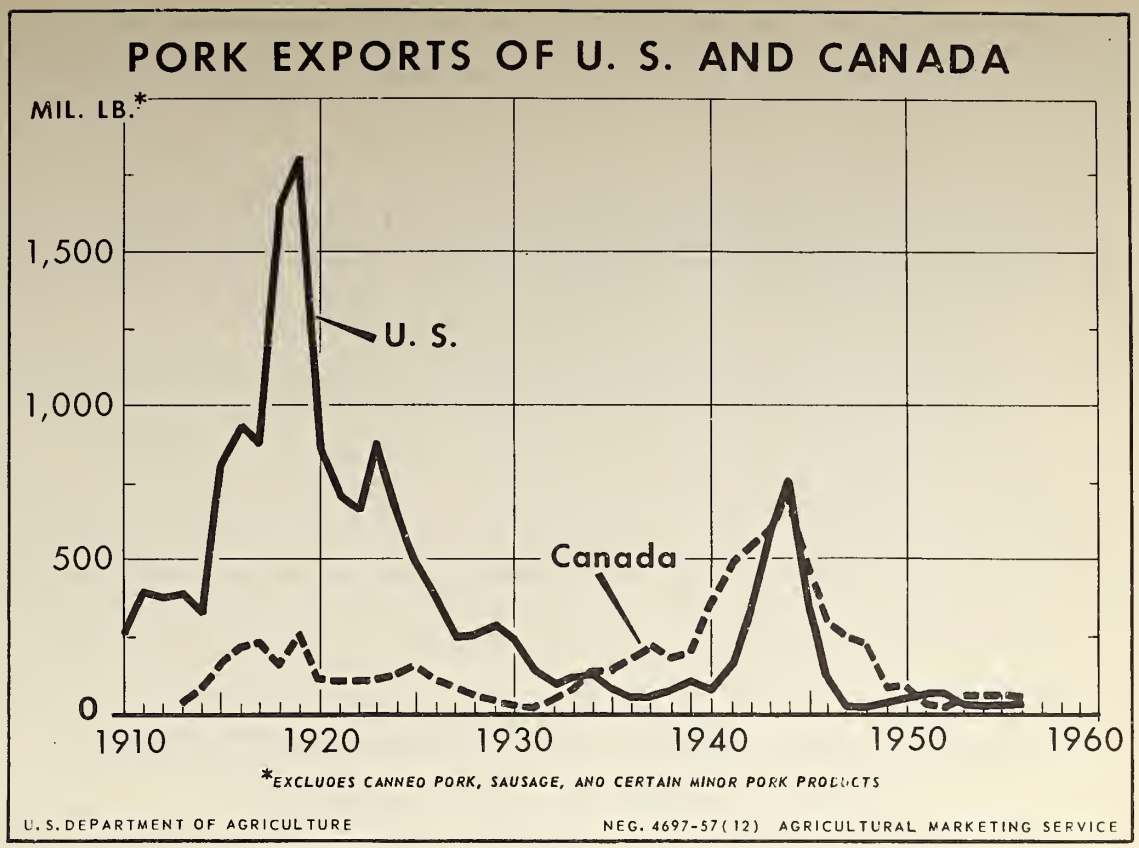

Figure 16.

grading of hogs. By January 1932, official live grading had been made compulsory in all provinces except Quebec, where compulsory grading was begun a few years later.

The development of the grading program in Canada took place in three stages:

1. Compulsory grading of all hogs at stockyards and abattoirs.

2. Compulsory grading, or identification for later grading, at country shipping points.

3. Compulsory purchase and sale according to grade.

As live grading developed, the principle became more widely accepted, and interest in the efficiency of grading increased. From time to time, the graders' interpretations of grade standards were questioned. Experiments in carcass grading of hogs were initiated as early as 1928 in Canada, partly as an aid in checking the accuracy of live grading. In all cases, a check grade of the carcasses after slaughter was acceptable as a final court of appeal. This led to serious consideration of making a system of carcass grading available. In March 1934, provision was made for the carcass grading of hogs at the option of both buyer and seller. By 1940, most of the hogs in Canada were being bought and sold on the carcass basis. Producers of better quality hogs were selling on the carcass basis in order to get the most for their hogs. Producers of poorer type, overfat, and low-yielding hogs were still selling on the live-weight basis. Because the

carcass system had become generally accepted and because it was becoming increasingly difficult to maintain efficiently the double service of live and carcass grading during the early years of World War II, live grading was discontinued, and carcass grading was designated as the only official system, beginning in October 1940. It has remained so ever since.

Contrary to common assumption in this country, purchase by packers on the carcass weight and grade basis is not mandatory in Canada. Carcass grading, however, is the only official system of grading by which government premiums can be paid to farmers for superior carcasses. The government makes a direct payment to farmers for each hog marketed in the two top grades. Accurate carcass weights are required as a part of the Canadian hog carcass grades. Since all carcasses are weighed and graded, and since records are kept of the weights and grades of carcasses from each producer, settlement on the basis of prices established on carcass weights and grades is most convenient for Canadian meat packers, and has become customary.

The changes in proportions of barrows and gilts of the different grades sold in Canada since the beginning of the grading program are summarized in figure 17. Initially there were two basic grades of live hogs, the thick smooth grade, which was sometimes called the lard-type, and the select bacon grade. The select bacon grade was judged to be suitable for the top Wiltshire sides for the British market. In 1929, the thick smooth grade was split into a bacon grade and a butcher grade. Butchers included those hogs which were excessively overfinished. The sharp decline in the percentage of butcher grade hogs from 1929, a year after live grading was made compulsory in the Province of

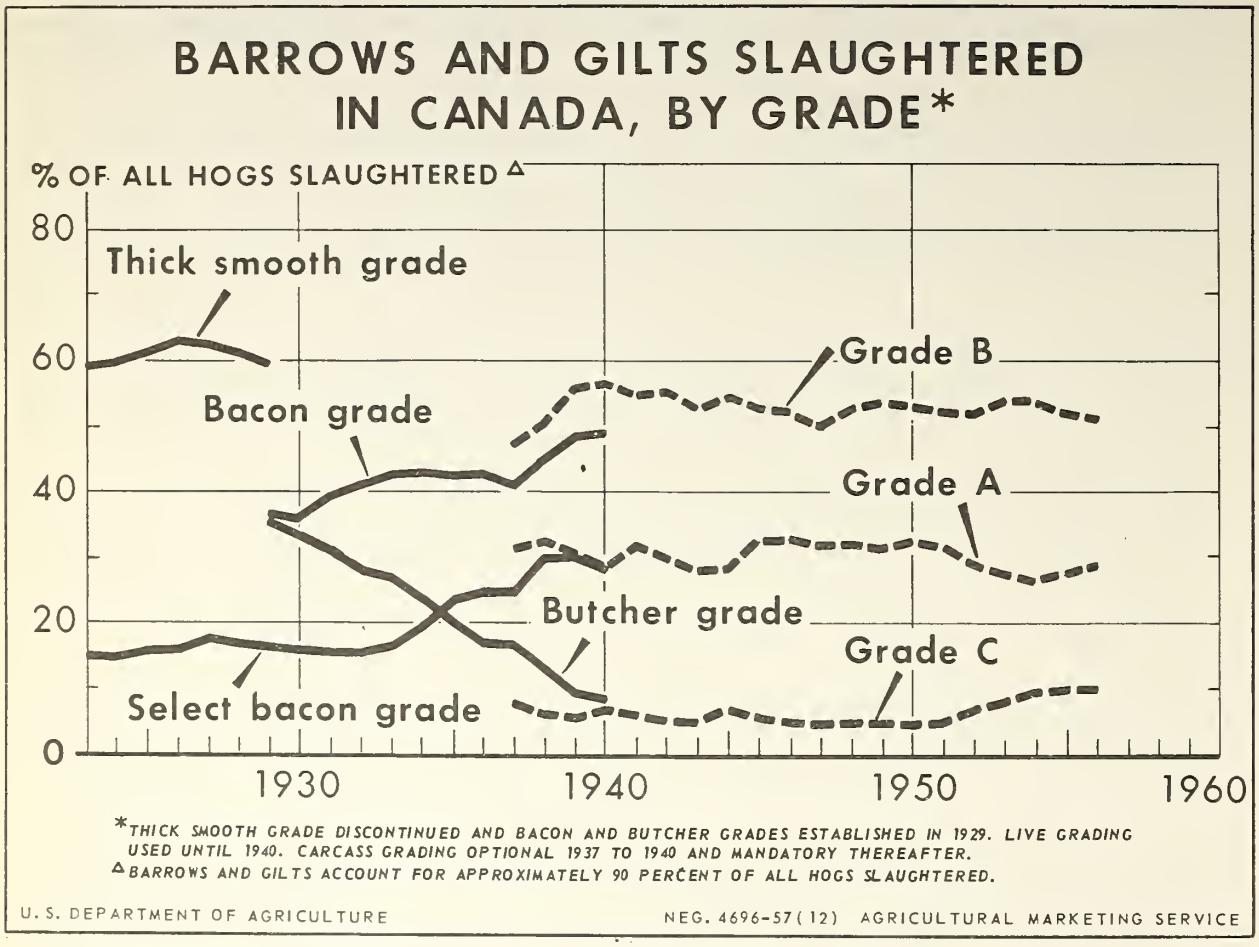
BARROWS AND GILTS SLAUGHTERED IN CANADA, BY GRADE*
% OF ALL HOGS SLAUGHTERED △
80
60
40
20
0
Thick smooth grade
Bacon grade
Select bacon grade
Butcher grade
Grade B
Grade A
Grade C
1930
1940
1950
1960
*THICK SMOOTH GRADE DISCONTINUED AND BACON AND BUTCHER GRADES ESTABLISHED IN 1929. LIVE GRADING USED UNTIL 1940. CARCASS GRADING OPTIONAL 1937 TO 1940 AND MANDATORY THEREAFTER.
△BARROWS AND GILTS ACCOUNT FOR APPROXIMATELY 90 PERCENT OF ALL HOGS SLAUGHTERED.
U. S. DEPARTMENT OF AGRICULTURE
NEG. 4696-57(12) AGRICULTURAL MARKETING SERVICE

Figure 17.

Ontario, until 1940, is rather striking. In 1929, 35 percent of the hogs in Canada were butcher (fat) grade. By 1940, the percentage had dropped to 8.2. The bacon grade, which would be somewhat comparable to grade B carcasses, increased in importance immediately after it was established. It accounted for 36.5 percent of the hogs in 1929, and about 49 percent in 1940. The select bacon grade, which corresponds to the top A grade carcasses, appeared to increase somewhat later. The number of hogs in this grade expanded from 15 percent of all hogs slaughtered (live grades) in 1932, to about 30 percent in 1940. Carcass grading and official live grading were both used from 1934 until 1940, when carcass grading became the single official system. The stability of the grade distribution during the early 1940's may be significant. Quality was maintained in spite of an increase in live weights of nearly 20 pounds per hog above weights of the 1937-40 period.

The distribution among grades did not change greatly until after 1950, when the greater availability of surplus feedstuffs appears to have resulted in a slight increase in the grade C carcasses and a slight decrease in the grade A carcasses.

Carcass Grade Standards in Canada Compared With U. S. Carcass Standards

Carcass grade standards were established in Canada in 1934. These are briefly described for barrows and gilts in table 3. A major objective or purpose of these grade

TABLE 3.--Standards for grades of barrow and gilt carcasses in Canada[1]

Canadian grade	Maximum shoulder fat	Maximum loin fat	Weight[2]	Minimum length
	Inches	*Inches*	*Pounds*	*Inches*
A	2	1 1/2	140 to 170	29
B_1	[3] 2 to 2 3/4	[3] 1 1/2 to 2	135 to 175	[3] 28 to 29
B_2	2	1 1/2	125 to 134	27
B_3	2 3/4	2 1/4	176 to 185	30
C	[3] 2 1/4 to 3 1/4	[3] 1 3/4 to 2 1/2	120 to 185	None
D	None	None	120 to 185	None
Lights	None	None	Under 120 pounds	None
Heavies	None	None	186 to 195	None
Extra heavies	None	None	196 and up	None

[1] Grade A carcasses are of good quality in all respects. In addition to the weight and fat requirements shown in the table, the following defects may cause carcasses to be graded B rather than A--or C or D rather than B, if the defect is more serious:

Finish -- too thin.
Type -- Heavy shoulder, weak loin or ham, out of balance, etc.
Color -- Dark skin pigment or hair roots remaining on carcass.
Roughness -- Old injury, deformed, late castration, rough skin, arthritic joints (such defects not serious enough for carcass to be graded "physical injury.")

Grade C carcasses are overfat. Grade D carcasses may be fat or may be underfinished. Lights, heavies, and extra heavies must have reasonable finish and quality.

[2] In comparing U. S. and Canadian carcass weights, it is important to remember that the two countries have a different style of dressing carcasses. In Canada, the head, the ham facings, and leaf fat are left on the carcass until it is weighed. This is called the "shipper style dress." In the United States, carcasses are weighed at the so-called "packer style dress" in which the head and leaf fat are removed and the hams are faced. Shipper style carcasses would weigh about 11 percent more than packer style from identical hogs.

[3] According to weight.

standards was to provide specifications for the type of pork carcasses which would meet the exacting requirements of the British trade in Wiltshire sides. The specifications for the A grade provided a selection device for that type of carcass.

Although some grade B carcasses were exported, they could not meet the requirements for the top of the British market. Nevertheless, they were fairly satisfactory for domestic pork consumption. These carcasses were graded down because they were too light, too heavy, overfat, or of poor type or conformation. In addition, dark skin pigment or dark hair roots remaining on the carcass after the dehairing process were a factor which would automatically eliminate a carcass from grade A and place it into one of the grade B categories. This factor largely accounts for the predominance of white breeds of hogs in Canada today. Grade B carcasses are broken down into three subcategories, B_1, B_2, and B_3. Grade B_1 includes carcasses with minor imperfections in general type and finish or with deviations of 5 pounds or less from the upper and lower limits of carcass weights in the A grade. In actual practice, however, most B_1 hogs are slightly too fat for the A grade. Grade B_2 carcasses are considerably lighter than the A grade, and grade B_3 carcasses are considerably heavier. Grade C, the third important carcass grade, covers decidedly overfat carcasses. Grade D carcasses may be extremely fat, but most of them are underfinished.

The U. S. standards for grades of slaughter barrows and gilts, and for barrow and gilt carcasses, were first announced tentatively in 1949, later revised and made official in 1952, and again revised as official standards in 1955. By use of the standards, live hogs or carcasses are sorted into categories according to the proportions of high-value lean cuts and of lower value fat cuts and lard yielded. Live hog standards are designed to provide means of estimating carcass grades before slaughter. Measurement specifications for U. S. hog carcass grades are shown in table 4. Grade 1 carcasses are expected to yield a high percentage of lean cuts and a relatively low percentage of lard. Grades 2 and 3, respectively, yield lower proportions of the valuable lean cuts and higher proportions of lard. The Cull and Medium grades, while they may yield less lard and a higher proportion of lean cuts, include carcasses which, in contrast to grades 1, 2, and 3, lack adequate finish to consistently produce wholesale cuts of sufficient firmness and quality.

> "The standards for grades of barrow and gilt carcasses include carcass measurements and descriptions of carcass characteristics which indicate the lean and fat yields and imply the quality of meat typical of the minimum degree of finish of each grade. Visual estimates of fat thickness normally alleviate the necessity for measuring carcasses in the grading operation. In addition to the measurement guides to grade differences, the standards also provide the basis for consideration of other characteristics. While carcass measurements furnish a reliable general guide to grade, the final grade of borderline carcasses may vary from that indicated by measurements due to consideration of other characteristics such as visual evidences of quality; meatiness; conformation of hams, loins, bellies, and shoulders; and fat distribution. However, application of these additional factors is limited to borderline carcasses, and in no case may the final grade be more than one-half of the width of a grade different than that indicated by carcass measurements."[4] (See table 4.)

Canadian and U. S. grade standards have one important point in common. In both countries, backfat thickness is used as the primary device to sort hog carcasses into different categories of excellence. There are a number of differences between the systems of grading in Canada and the United States, however. In Canada, carcasses are

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[4] U. S. Dept. Agr., AMS, "Official United States Standards for Grades of Pork Carcasses (Barrow and Gilt)," Service and Regulatory Announcement No. 171, July 1955.

TABLE 4.--Weight and measurement guides to United States grades for barrow and gilt carcasses

Carcass weight or length[1]	Average backfat thickness by grade[2]				
	U. S. No. 1	U. S. No. 2	U. S. No. 3	Medium	Cull
	Inches	*Inches*	*Inches*	*Inches*	*Inches*
Under 120 pounds or under 27 inches	1.2 to 1.5	1.5 to 1.8	1.8 or more	0.9 to 1.2	Less than 0.9
120 to 164 pounds or 27 to 29.9 inches	1.3 to 1.6	1.6 to 1.9	1.9 or more	1.0 to 1.3	Less than 1.0
165 to 209 pounds or 30 to 32.9 inches	1.4 to 1.7	1.7 to 2.0	2.0 or more	1.1 to 1.4	Less than 1.1
210 or more pounds or 33 or more inches	1.5 to 1.8	1.8 to 2.1	2.1 or more	1.2 to 1.5	Less than 1.2

[1] Either carcass weight or length may be used with backfat thickness as a reliable guide to grade. The table shows the normal length range for given weights. In extreme cases where the use of length with backfat thickness indicates a different grade than by using weight, final grade is determined subjectively as provided in the standards. Carcass weight is based on a chilled, packer-style carcass. Carcass length is measured from the forward point of the aitch bone to the forward edge of the first rib.

[2] Average of measurements made opposite the first and last ribs and last lumbar vertebra.

graded according to the maximum allowable backfat thickness at two points, at the shoulder and at the loin. In the United States, average backfat thickness, measured at three points, opposite the first and last ribs and last lumbar vertebra, is used to grade hog carcasses. Another difference is that Canadian standards use weight as a grading device. Only carcasses within the 30-pound weight range from 140 to 170 pounds can be given the A grade. B_1 carcasses have a slightly wider range of tolerance, B_2 and B_3 together make a still wider range, and grades C and D include a 65-pound range from 120 pounds to 185 pounds.[5] In the United States, weight is used as a classifying device rather than a grading device. Thicker backfat specifications are permitted for heavier carcasses to maintain the same percentage of lean cuts within a grade. In Canada there are minimum length requirements for the two top grades. In the United States, length may be used as a classifying device in lieu of carcass weight as a measure of size. Type is given some consideration in both countries, but it appears to be given more consideration in Canada than in the United States. Canadian carcasses are discounted in grade for having heavy shoulders, weak loins, or being out of balance. Dark skin pigment or hair roots remaining on the carcass are also an important consideration, eliminating carcasses from the A grade in particular. This factor is given no consideration in the United States. Other defects due to roughness from injuries and deformities resulting from diseases are also factors which are used to eliminate carcasses from the A grade. These are given minor, if any, consideration in the United States.

Although the Canadian carcass standards were built around the requirements of the British export market, they appear to have performed satisfactorily for the domestic trade as well. They accomplish essentially the same purpose as the American standards in sorting carcasses which have a greater proportion of high-value lean cuts, with adequate finish, from those carcasses which have a lower proportion of high-value cuts and a much higher proportion of fat for rendering into lard.

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[5] See footnote 2, table 3, for a comparison of U. S. and Canadian carcass weights from the same weight of hog.

During the tour of Canada in October 1957 by the United States swine study group, 530 barrow and gilt carcasses were graded according to both the Canadian and the U. S. grading systems in 3 packing plants in eastern Canada. This was to gain a better understanding of Canadian statistics on grading and to interpret them more accurately in terms of U. S. grades. The U. S. grades were applied by the swine and pork grading specialist from the Standardization Branch, Livestock Division, Agricultural Marketing Service, U. S. Department of Agriculture. The Canadian grades were applied by the regular Canadian government grading personnel on duty when the U. S. study group visited the killing floors of the three plants.

TABLE 5.--Distribution of 530 barrow and gilt carcasses in eastern Canada by U. S. and Canadian grades

Canadian grades	U. S. grades					
	U. S. 1	U. S. 2	U. S. 3	Medium	Total	Percentage of total
	Number	*Number*	*Number*	*Number*	*Number*	*Percent*
A	167	0	0	2	169	32
B	194	95	1	4	294	55
C	8	42	8	0	58	11
Heavy	3	1	0	0	4	1
Light	3	0	0	2	5	1
Total	375	138	9	8	530	100
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Percentage	71	26	2	1	100	--

Of the 530 hog carcasses, 169, or 32 percent, graded as A, and 294, or 55 percent, graded as B under the Canadian system (table 5). Of the same 530 carcasses, 375, or 71 percent, would have graded U. S. No. 1, and 138, or 26 percent, would have graded U. S. No. 2 in the United States. This suggests that Canadian standards are more discriminating than the American standards in their actual operation. Most of the A grade carcasses appear to fall within the top half of the U. S. No. 1 grade. About two-thirds of the B grade carcasses fell in the U. S. No. 1 grade, while one-third fell in the U. S. No. 2 grade. Most of the C grade carcasses would fall in the bottom half of the U. S. No. 2 grade. The eight C grade carcasses which fell in the U. S. No. 1 grade were probably discounted according to Canadian standards for either type, roughness, pigment, or weight. Only 2 percent of all hog carcasses graded would have fallen in the U. S. No. 3 grade.

Thus it appears that more than two-thirds of Canadian pork production would be graded U. S. No. 1. Canada has almost eliminated hogs that would grade No. 3 under United States standards. The 3 Canadian grades, A, B, and C, apparently cover approximately the same span or range of finish as do the 2 U. S. grades 1 and 2.

Of the 530 hog carcasses, 294 were in the Canadian grade B. Table 6 presents a distribution of these carcasses by U. S. grades, and also classifies them according to the reason they were placed in the Canadian B grade. Sixty-one percent were graded B because of overfinish. This illustrates the primary importance given fatness in the Canadian grading system. However, 29 percent were also graded B because they were beyond either the upper or lower weight limitations for the A grade. Type was the factor that downgraded 5 percent of these hogs. However, about 15 percent of the hogs which were listed as too fat also had type checked as a factor by the Canadian grader.

TABLE 6.--Reasons given by Canadian graders for downgrading 294 carcasses from A to B, classified by U. S. grades

Reason for B grade	U. S. grades					
	U. S. 1	U. S. 2	U. S. 3	Medium	Total	Percentage of total
	Number	*Number*	*Number*	*Number*	*Number*	*Percent*
Too fat	106	73	1	0	180	61
Type	14	1	0	0	15	5
Too heavy[1]	22	16	0	1	39	13
Too light[1]	43	2	0	1	46	16
Pigment	5	1	0	0	6	2
Too thin	2	1	0	2	5	2
S, R, or L[2]	2	1	0	0	3	1
Total	194	95	1	4	294	100
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	
Percentage	66	33	--	1	100	--

[1] About half the too heavy (for A) were B_1 and half were B_3. About half the too light (for A grade) were B_1 and half were B_2. All the other carcasses in this table were B_1

[2] S - Shoulder heavy, bulging, or deep.
R - Rough (deformation, injury, etc.)
L - Loin weak in fleshing.

No reliable figures are available on the grade distribution of barrows and gilts in the United States. Various estimates, however, have indicated that between 15 and 30 percent of all barrows and gilts grade U. S. No. 1.

There are other indications of the generally superior level of quality of Canadian hogs compared to that of United States hogs. One Canadian packing plant official, with plants in both the United States and Canada, stated that, with trimming and cutting methods characteristic of the United States, hogs in the United States yielded roughly twice as much lard as hogs in Canada.

One packing plant in Canada's Province that has the highest grade hogs reported average yields of lard of 10 pounds per hog. A plant of the same firm in Canada's lowest grading Province reported an average lard output of about 20 pounds per hog. In the United States, lard yields have averaged around 34 pounds per hog in recent years. These comparisons are more significant in the light of the fact that pork cuts in Canada are trimmed more closely and are bonded and defatted to a much greater extent than in the United States. In addition, the lean cuts from the Canadian pork contain less internal fat, especially in the shoulders.

With this evidence that Canadian pork is leaner than that of the United States, it is interesting to note that both the Canada Department of Agriculture and the meatpacking industry in Canada regard the "fat problem" as the No. 1 problem of pork production in Canada.

Price Differentials and Premiums for Hogs in Canada

Since October 1922, when hog grading and premium payments began on an optional basis, a variety of methods has been used by Canadian packers to arrive at premiums or discounts for the various grades. At times, the premium has been on a percentage-of-value basis, at times on a per-head basis, and at times on a weight basis.

At present, value differentials between grades of hogs in Canada include both the price differentials paid by packers and a government bonus or premium paid for grade A and grade B_1 carcasses. Packers began paying premiums in 1922 and the government added a quality bonus for the 2 top grades in 1944. Price differentials paid by packers simply represent the difference between prices paid per 100 pounds of carcass weight for the different grades. The government bonus is paid on a per-carcass basis.

In October 1957, packers were paying a price differential of $1 per 100 pounds of carcass weight between grades A and B_1. At most markets, they were paying a differential of $2 between grades B_1 and C, or a total of $3 between grades A and C. Although, as a rule, price differentials paid by packers are relatively stable, they do vary occasionally. They have been maintained by agreement rather than by regulation, with representatives of producers and packers conferring from time to time, usually with representatives from the Canada Department of Agriculture acting in an advisory capacity. Prices for the lower grades are set according to supply and demand for the various weights and qualities.

The packer-paid portion of the differentials at Toronto between grade A carcasses and B_1, B_2, B_3, and C grade carcasses are shown in Table 7 for the weeks of December 12, 1955-57. This table indicates that the differential for C grade hogs tends to vary more than that for the other grades. The discount for grade C was $2.80 per 100 pounds of carcass weight at Winnipeg, $4.00 at Toronto, and $3.00 at other main markets during the week of December 12, 1957. The $4.00 differential at Toronto suggests that packers there may have been receiving an excessive number of grade C carcasses. Differentials vary occasionally from market to market. They can change on any particular grade at any time. But within any one market area, most packer buyers offer the same differentials.

The $3.00 market price differential per 100 pounds carcass weight between grade A and grade C paid by most Canadian packers in October 1957 raises a question whether price differentials could be wider in the United States than they are. The value difference between U. S. No. 1 and U. S. No. 3 carcasses of $1.60 per 100 pounds is about half the $3.00 Canadian differential between grades A and C (table). Live-weight value differentials in the last column of table 8 take into account the difference in carcass dressing methods in the two countries. These indicate that the Canadian packer differentials, not counting the government bonus, are about 2.5 times those indicated for the United States. However, Canadian packer differentials are probably more than 3 times those indicated for the United States, because the total range in fatness for grades A, B, and C in Canada is about equivalent to the total range for grades 1 and 2 in the United States. Three grades in Canada cover approximately the range of fatness of 2 grades in the United States.

In addition to the packer-paid differentials referred to in tables 7 and 8, the Canadian government pays to the producer a bonus of $2 for each grade A carcass slaughtered and $1 for each grade B carcass. These bonus levels have been in effect since April 1956. From January 1944, when the government bonus was initiated, until April 1956, the grade A bonus was $3 per carcass and the grade B_1 bonus was $2.

Results of one cutting test conducted by the Canada Department of Agriculture using the regular style of trim are shown in table 9. Yields are shown only for the lean cuts. The difference in yield of 4 lean cuts between grade A and C, 5.2 percent, would be

TABLE 7.--Price differentials per 100 pounds on pork carcasses paid by Toronto packers, using grade A as the standard, weeks of December 12, 1955-57

Grade differential	1955	1956	1957
	Dollars	*Dollars*	*Dollars*
A - B_1	1.00	1.00	1.00
A - B_2	1.25	1.25	1.25
A - B_3	1.60	1.60	1.60
A - C	3.00	3.50	4.00

TABLE 8. Value and price differentials for 150-pound pork carcasses by grade, Canada and United States, October, 1957[1]

Country and grade	Price per 100 pounds paid by packer for -			
	Carcass weight		Live weight	
	Price[2]	Price differential	Equivalent price[3]	Price differential
	Dollars	*Dollars*	*Dollars*	*Dollars*
Canada				
A	29.00		21.60	
		1.00		.60
B_1	28.00		21.00	
		2.00		1.37
C	26.00		19.63	
A - C		3.00		1.97
United States				
No. 1	29.40		19.84	
		.80		.40
No. 2	28.60		19.44	
		.80		.40
No. 3	27.80		19.04	
1 - 3		1.60		.80

[1] See footnote 2, table 3, for discussion of differences in carcass yields, U. S. and Canada. In Canada, a 150-pound carcass is equivalent to a 200-pound live hog. In the United States, a 150-pound carcass is equivalent to a 220-pound live hog.

[2] Prices for the United States are the computed values shown in table 1, not necessarily prices actually paid.

[3] The equivalent live-weight prices and differentials per 100 pounds live-weight were computed assuming the following dressing percentages: Canada A, 74.5; Canada B_1, 75.0; Canada C, 75.5; U. S. No. 1, 67.5; U. S. No. 2, 68.0; U. S. No. 3, 68.5.

somewhat less than the 6 percent difference expected from the cutting tests available in the United States between grades 1 and 3, because Canadian grades cover a narrower range in finish.

The regular style of trim is rapidly decreasing in importance in Canada, however. More and more cuts are being completely boned and defatted. The largest Canadian packing firm reported that more than 50 percent of its hams and butts were sold in this manner. One medium-sized plant in eastern Canada reported the following approximate percentages of cuts that are sold in boneless defatted form: Hams, 90 percent; butts, 75

TABLE 9--Yield of 4 lean cuts of pork as a percentage of carcass weight with regular trim, Canadian grades A and C

Wholesale cut	Grade A	Grade C	Difference
	Percent	*Percent*	*Percent*
Ham	20.5	19.0	1.5
Loin	15.7	14.1	1.6
Picnic	9.6	8.4	1.2
Butt	7.8	6.9	.9
Total	53.6	48.4	5.2

percent; picnics, 50 percent; and loins, 30 percent. At the same time, this plant buys a large amount of "backs" (boneless loins) from western Canada. Many of the loins in Canada are boned and converted to what the Canadians call "back bacon," or what is called in the United States, "Canadian-style bacon." It is more difficult to defat the Boston butts as completely as hams, loins, and picnics, because of the fat deposited between the several layers of lean meat within the cut. Nevertheless, this cut is also boned and defatted as much as possible. Canadian shoulder cuts, however, usually carry much less intermuscular fat than do shoulder cuts in the United States. With major lean cuts being boned and defatted to a greater extent, yield differences in lean cuts become more important.

Data in table 10, supplied by a Canadian packing plant, illustrates this point. In this table, the differences in yield of 4 lean cuts between grades A and C was 8.4 percent as compared with 5.2 percent under the regular trim in another test. Because these cuts are boned and defatted, they must sell at a higher price in order to compensate for the loss in weight from the additional processing and for the labor and other costs of processing. This also increases the value differential between grades.[7]

At an average value of 50 cents per pound for the boned lean cuts, the 8.4 percent differential in yield of lean cuts between A and C grade carcasses would be worth $4.20 per 100 pounds of carcass weight. This difference is compensated for, to a degree, by the additional fat and the extra weight of bellies, in the fatter grade carcasses. When these compensating factors are given consideration, however, the total value difference per 100 pounds of carcass weight proves to be about $3.00 per 100 pounds. This $3.00 per 100 pounds of carcass weight is equal to the price differential which was actually paid by most packers in Canada during the fall of 1957. (table 8).[8]

Another significant element pertaining to the high proportion of boned and defatted cuts in Canada is the fact that Canadian packers have emphasized, to a far greater extent than their counterparts in the United States, the importance of standardizing the product they place before retail customers. Standardization is the No. 1 lesson in merchandising.

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[7] If a 220-pound U. S. No. 1 hog yields a 15-pound skinned ham and a No. 3 hog of the same weight a 13-pound ham, the difference in yield is 2 pounds. If, in standardizing hams to the boneless defatted product, 2 pounds of fat, skin, and bone are removed from the ham from the U. S. No. 1 hog and 3 pounds are removed from the No. 3, the difference in yields will be 3 pounds. The boned and defatted hams, of course, sell for a higher price than bone-in hams, making the value difference even more important than the physical yield difference. With regular hams selling at 40 cents a pound, the value differential contributed by hams alone would be 80 cents per ham, or 72 cents per 100 pounds of live hog. With boned and defatted hams selling at 50 cents a pound, the value differential would be $1.50 per ham, or $1.36 per 100 pounds of live hog.

[8] One Canadian authority commented that the trade and the main farm organizations consider the discount of $3 on C grade carcasses to understate actual value differences between C and A carcasses. The fat belly of a C carcass sells at a heavy discount. The fresh loins are marketed with greater difficulty because of internal fat. Picnics and butts also present a serious problem. Although Toronto packers were paying a $4 differential in the fall of 1957, most packers do not feel that they can impose a heavier discount than $3 per hundredweight.

TABLE 10.--Yield of 4 lean cut pork as a percentage of carcass weight, Canadian grades A and C, most cuts boned and closely trimmed

Wholesale cut	Grade A	Grade C[1]	Difference
	Percent	*Percent*	*Percent*
Ham	15.7	12.2	3.5
Loin	14.1	12.1	2.0
Picnic	6.4	5.1	1.3
Butt	[2] 8.1	6.5	1.6
Total	44.3	35.9	8.4

[1] Carcasses graded C for fatness only, excluding carcasses graded C for conformation.
[2] The 8.1 percent figure for butts is not comparable to the figure for butts in table 9. This probably represents a difference in basic cutting methods used in the two different tests.

When a Canadian housewife buys a rolled, boneless half ham, she knows precisely what she is getting, a virtually all-meat product with only a thin layer of outer fat from an eighth to a quarter of an inch thick. She knows that she can go to the same store several weeks later and buy another ham that will be equally satisfactory to her. Canadian packers have succeeded in giving the customer a repeatable experience.

Bone-in hams as processed and sold in the United States do not present as consistent a picture to the housewife. All hams of a given weight range are sold together, regardless of fatness. The housewife may be fortunate in choosing a relatively lean ham, but again she may have the misfortune of choosing a ham which has a sizable pocket of inner fat around the bone and a sizable cushion of outer fat around the shank end. Experiences such as this are not conductive to an increased demand for ham.

Picnics also are sold defatted, rolled, and boneless in Canada. Boston butts are boned and defatted to the extent possible. Fresh cuts in Canada, such as pork loins and roasts, though often sold with less defatting than cured cuts, as in the United States, nevertheless, carry less fat between the several layers of meat because of the high proportion of Canadian hogs that fall in the range of finish covered by the U. S. No. 1 grade.

Rolled and boneless cuts must be sold at higher prices per pound retail weight to compensate for some extra labor and for the loss in weight of the bone and fat removed. Canadian customers have apparently been educated to accept this fact.

Operational Methods and Costs of Carcass Grading and Buying System in Canada

Although the carcass method of buying hogs is common in much of western Europe, it is still little used in the United States. Canada initiated the system in 1934 after several years of discussion and experimentation, and adopted it as the sole official method in 1940. During the experimentation, the Canadians solved their technical problems of carcass weighing, grading, and identification.

In Canada, shippers (or truckers) must place a distinct tattoo mark on each hog of each producer's lot when it is shipped by him to any packing plant or market if the farmer is to obtain the government bonus. Each shipper has a different tattoo mark for each producer. The shipper must deliver a manifest to the buying establishment with each load, listing the number of hogs from each producer, the respective tattoo numbers, and

names and addresses. When hogs are brought to the packing plant by the producer himself, the tattoo mark is placed on the hogs before they are mixed with other hogs in the packer's holding pen.

After the hog is killed and the viscera are removed, the warm carcass goes over a scale and, in the larger plants, the weight is automatically stamped on both halves of a break-apart cardboard ticket (fig. 18), which is then attached to the carcass. When the carcass reaches the grader's platform, the grader examines the carcass, breaks off the lower half of the ticket, and on it records the grade. If the carcass receives any grade other than A, the reason or reasons are checked by the grader. An assistant employed by the plant then takes the grader's ticket half and adds to it the tattoo number which she reads off the side of the carcass as it passes the grading stand. The ticket half now contains the carcass weight, the carcass grade, the reason for downgrading, if any, and the tattoo number. Figure 19 shows the grader at work and his assistant entering the tattoo numbers from the carcass shoulder onto the scale ticket.

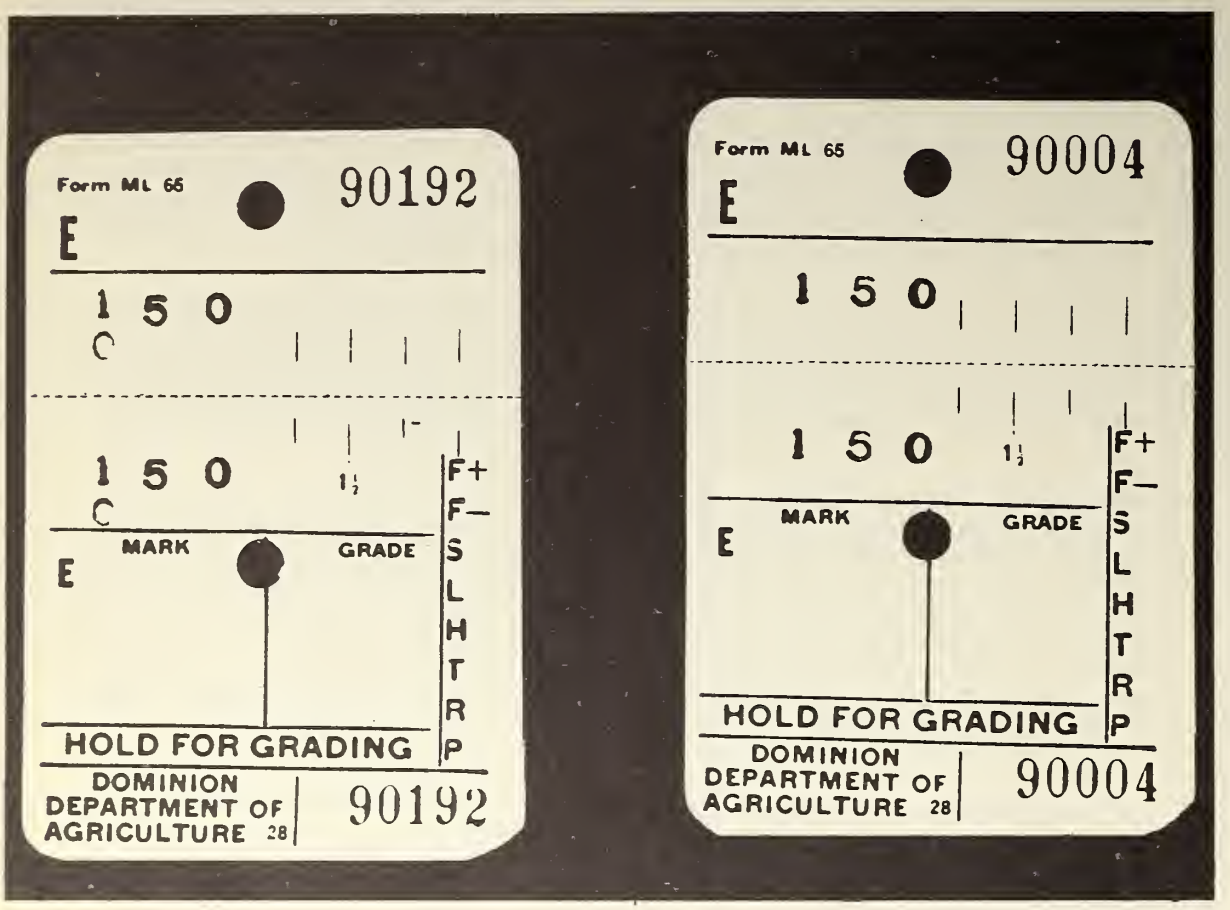

Figure 18.

"Hog Scale Tickets--Canada"

(Courtesy Canada Department of Agriculture)

Figure 19.

"Grader at Work"

(Courtesy Canada Department
of Agriculture)

The grader's assistant usually makes a preliminary sort of the ticket halves according to the tattoo numbers. If the packer has kept the producer's lot of hogs fairly close together on the killing line, they can all be weighed and graded and the tickets sorted within a few minutes. Delay in final settlement to the producer caused by carcass grading does not usually exceed 1 day. Office procedures in the plant have been streamlined. In most plants, the completed tickets are relayed to the office at frequent intervals during the kill, so that work on settlements may be speeded. The combination premium warrant (government check), grade certificate, and statement of settlement by the packer (fig. 20) will have been partly prepared in advance from the manifests sent in before the time of slaughter. A large proportion of the hogs are killed on the day they leave the farm, and settlements may go out that evening or the morning after the kill.

At smaller plants that cannot use a full-time grader, the day's kill may be graded as it hangs in the chill room. Often, one grader may serve several small plants and may also grade other species of livestock.

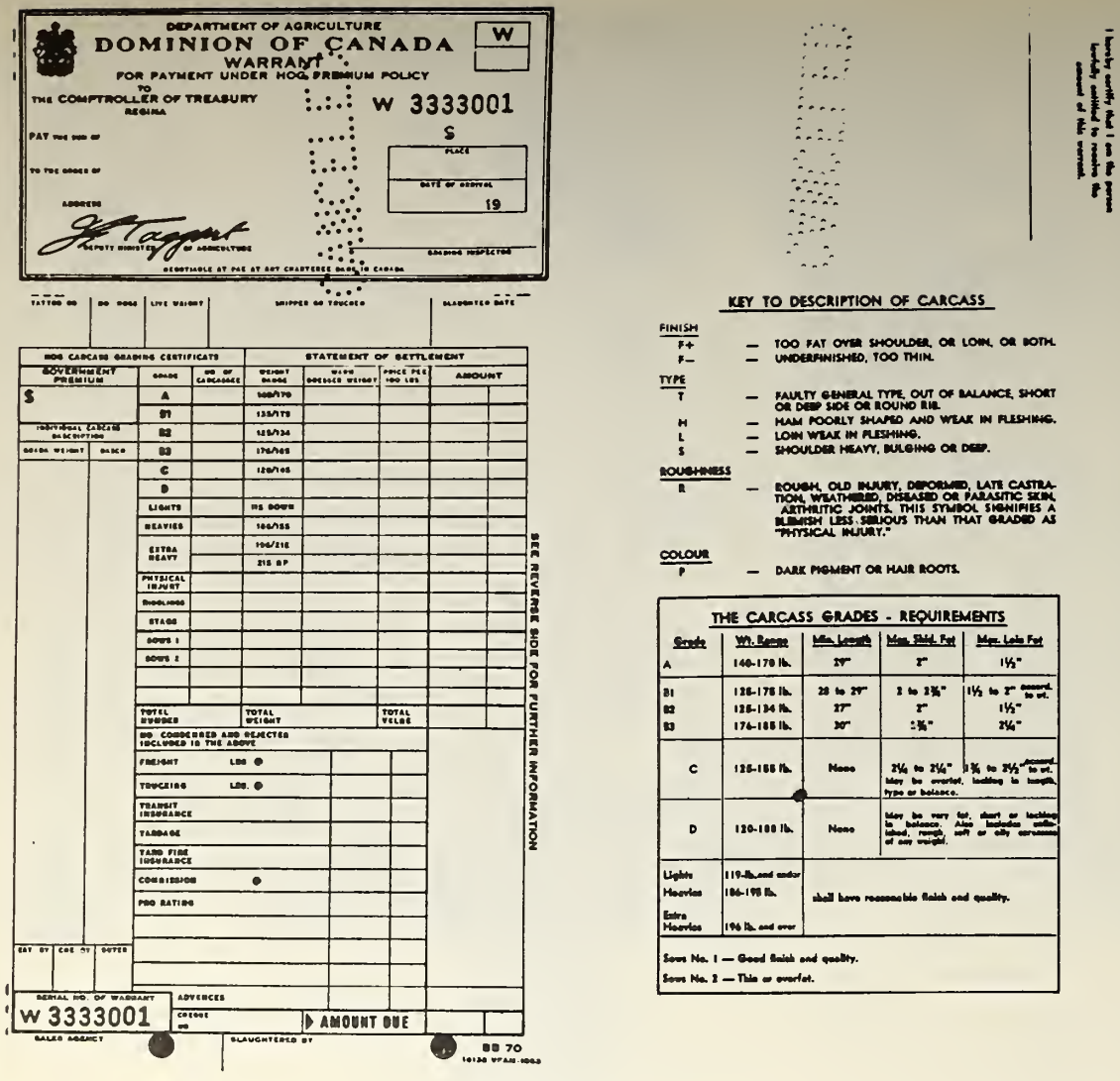

Figure 20.

"Combination premium warrant, grade certificate and statement of settlement. Face of document at left, reverse side at right"

(Courtesy Canada Department of Agriculture)

After the producer receives his combination statement, he tears off the government premium warrant, endorses it, and cashes it as any other check. If producers elect to keep litters separate in shipping their hogs, they can, by this method, obtain the grade distribution of offspring from individual parent animals.

The purpose of the government premium has been to encourage the production of high-quality hogs in Canada. The Canadian method of handling the grade certificate and government premium warrant is intended to get the grade certificate, as well as the premium for quality, back directly into the hands of the farmer who is responsible for the

quality produced. The government-payment portion of this program costs the Canadian Government from 5 to 6 million dollars a year, or an average of approximately $1 per hog slaughtered.

The cost of the actual operation of the grading service in addition to the incentive payments is somewhat difficult to estimate, because graders serve multiple functions. They may grade other species, may also assist in preparation of market news reports, and may assist in the regulation of livestock markets. Canadian officials have estimated that perhaps one-third of the budget of the Livestock Division of the Marketing Service of the Canada Department of Agriculture should be allocated to the cost of hog grading. This amount would be $300,000, or about 5 or 6 cents per hog marketed in Canada. The Livestock Division has a staff of approximately 160 people, of whom 90 do grading work. Hogs are graded in 113 plants distributed across Canada. The 53 plants under Federal inspection kill from 80 to 90 percent of the hogs slaughtered in Canada. The remainder are small plants which require 1, 2, or 3 visits a week from the grader. In addition to the cost to the government, mentioned above, packers and shippers have some expenses resulting from their cooperation in the grading program.

The main advantages of carcass grading as practiced in Canada have been summarized by the Canadians as follows:[9]

1. More definite determination of the degree and quality of finish and of belly quality.

2. Official grading of each farmer's lot of hogs.

3. Specific and accurate weight limitations within grade.

4. Elimination of inequalities due to the yield when carcass weight settlement is practiced.

5. Since each farmer's lot of hogs is identified, it is possible to:

   (a) Trace the origin of soft and oily carcasses and investigate causes.

   (b) Determine the presence of disease in herds and take steps to eradicate it.

   (c) Determine the breeding stock from which ridgling pigs originate and eliminate such strains.

   (d) Trace cause of bruising and reduce the occurrence.

   (e) Determine from carcass grading the sources of good breeding stock.

Some restrictive features also appear to be characteristic of the carcass method. Carcasses from hogs which have been shipped long distances weigh less than carcasses from identical hogs slaughtered close to the point of production. It may be more difficult for packers to procure hogs at some distance from their plants because of the uncertainty of the extent of this tissue shrinkage. In some cases, distant buyers pay an additional price to compensate for the possible tissue shrinkage during shipment. Another restrictive feature is the fact that it is not easy for a dealer to buy hogs from several farms and make up shipments to several different outlets. Tattoo marks are not always easily read on the live animal. The handling of hogs at community auctions presents similar problems. In western Canada, packers buy hogs on the carcass basis at some of the larger auctions, especially those operating in connection with the terminal markets, that are set up to handle sales through auctions on the basis of carcass grade. Another argument raised against the present Canadian method is that it results in the shipment of more hogs direct, circumventing the public market. When rail grading (grading of carcasses immediately after slaughter) was initiated in Canada, from one-third to one-

[9] Maybee, H. J., "Hog Grading in Canada," Pub. 961, Canada Dept. Agr. December 1955. p. 9.

fourth of the hogs were going to terminal public markets. In recent years, the proportion has dropped to about 10 percent. Canadian officials point out, however, that similar trends have been taking place in the United States, where the carcass system of buying has not been important.

Meatpackers in Canada are generally quite satisfied with the carcass method of buying hogs. Certain Canadian packing company officials indicated that using carcass grade and weight as a basis for hog pricing is a more accurate reflcetor of value differences and tends to result in improved quality. A statement from the Meatpackers Council of Canada, the one national trade association of Canadian meatpackers which includes major packers accounting for a substantial proportion of total slaughter, reports the following:

> "Under our present system of selling hogs on a basis of carcass grade and weight--the grading by experienced Government inspectors and the weight by automatic, officially supervised scales--producers are paid for exactly what they produce. They also have the additional advantage of knowing what faults can and should be corrected."[10]

The Response of Canadian Farmers to the Swine Production and Marketing Program

Most of the improvement in percentage of hogs in the top grades had been accomplished in Canada by 1940, 12 years after grading was first made mandatory in Ontario and 18 years after grades were first established in October 1922. Since that time, the effort has been primarily to maintain the gains previously achieved. More abundant feed supplies, with prices low in relation to live-hog values, and the changing character of feed supplies appear to have made feeding to heavier weights and feeding of higher energy feeds more profitable.

The percentage of Canada's hogs in the A grade has been relatively stable at about 30 percent since 1937. Some evidence suggests, however, that a considerable amount of improvement may be hidden behind this stable percentage. From 1942 to 1956, the average weight of carcasses marketed has been about 14 pounds heavier than during the 5-year period from 1937 to 1941, inclusive. This is an increase of about 20 pounds per hog on a live-weight basis. Carcasses tend to have a higher proportion of fat as market weight increases. One study indicates that a 9-percentage-point decrease in percentage of A grade hogs may be associated with each 10-pound increase in carcass weight.[11] This suggests that had the hogs not been improved genetically, the percentage of A grade carcasses would have dropped to about 20 percent of all hogs slaughtered, instead of remaining at about 30 percent.

When grading was inaugurated in the early 1920's, there were large concentrations of what were then called the lard-type breeds of hogs in Canada. These were the predominant breeds in the prairie provinces and in southwestern Ontario, and were found to some extent in all other areas.

English breeds of the so-called bacon type were intermingled with the other breeds. After grading became mandatory, a fairly rapid shift was made to the so-called bacon-type hog of English breeding, which was a white hog. This has been the dominant breed of hogs in Canada ever since.

Canada has had, since 1928, an Advanced Registry Program for selecting superior breeding stock of swine. Canada's one official Advanced Registry Program is administered by the Canada Department of Agriculture with the advice of a board containing representatives of farm, packer, and Department agencies.

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[10] A letter on Canadian Livestock Products, The Meatpackers Council of Canada, 200 Bay Street, Toronto, November-December 1957.

[11] Ontario Dept. Agr., Cir. No. 274, "Production of 'A' Grade Hogs," March 1956.

In the early years of the program, litter groups on test were kept on the farm, and feeding and management practices varied from farm to farm. Carcass scores were obtained from the test pigs at the packing plants where they were taken for slaughter and evaluation.

Advanced Registry testing stations through which superior strains of hogs could be identified were started in Canada in 1934. In the testing station program, 4 pigs of a litter are self-fed and slaughtered to yield carcasses of about 155 pounds. Carcasses are graded and scored according to the desirability of various carcass characteristics. One basic ration is fed at all testing stations and one system of scoring carcasses is used throughout the entire country. Efforts are made to standardize temperature and other factors of environment at all test stations. Under this system, different strains of hogs can be compared regardless of where progeny were tested. This differs from practices followed in the United States, where each breed association has its own Advanced Registry requirements with regard to growth rate and prolificacy. However, for meat-type certification, the breed associations use standard carcass requirements in terms of backfat, length, and area of loin eye.

In addition, in the United States, there are other programs in which State or local testing stations are operated, using different rations and systems for scoring carcasses. These represent three distinct programs performing functions that are handled by a single program in Canada.

In 1956, 926 station-fed tests were conducted in Canada, an increase of 219 tests over 1955. In 1956, 637, or 68 percent, of the test litters qualified their dams for advanced registry compared to 459, or 56 percent, in 1955; 323, or 57 percent, in 1954; and 209, or 46 percent, in 1953. Market grades for the 1956 test pigs were about 69 percent A, 30 percent B, and only 1 percent of other.

Plans are now being considered by the Canada Department of Agriculture to pay less attention in the future to some aspects of carcass score in evaluating test station carcasses. Primary emphasis will be placed on average backfat thickness and loin eye area, and perhaps length. This plan would remove almost all of the current emphasis on carcass balance (weight of hams compared to weight of shoulders), belly score, and score for type. More attention may be given to feed efficiency in evaluating test litters, and a special test for herd sires may be provided. Farmers may be given an opportunity to test crossbreeds. This change means that more attention will be given to such factors as average backfat thickness and loin eye area, measures which have proved themselves to be better indicators of overall carcass merit. Carcass scoring factors in the United States usually include backfat thickness, area of loin eye, length of carcass, and yield of lean cuts.

The Canadians have not yet made use of the live probe technique as a part of their swine evaluation and improvement program. This technique consists of measuring backfat thickness of the live hog with a thin metal ruler or a special probing device. The live probe may play a part in making on-the-farm testing more feasible.

Another fact to be considered in appraising Canadian progress in improving swine is the different character of the available feed supply. In most of the United States, hog production is closely associated with the production of corn, a high-energy feed concentrate. In Canada, the basic feed grain concentrates have been barley and oats, feed grains which have a higher fiber content and a lower energy rating than corn. Hogs of identical genotype will produce a higher proportion of high-grade carcasses when fed a basal ration of oats and barley than when fed a basal ration of higher energy grain concentrates such as corn.

A number of hog producers in Canada, especially the larger producers, who are perhaps more comparable to American hog producers in size of operation, also improve the quality of the hogs they market by the practice of restricted feeding during the latter part of the feeding period. Swine nutritionists have demonstrated that most hogs can be

fed a high-energy ration during the early (growing) part of the feeding period without materially increasing fat deposition (fig. 21). During the latter (or finishing) part of the feeding period, the energy level, in terms of calories fed per day, affects the rate of deposition of fat relative to lean in the carcass. It is in this part of the feeding period that the Canadian practice of feeding oats and barley as a basal ration, rather than corn, can yield important results in producing a higher proportion of high-grade carcasses.

Further reduction in fat deposition by restricted feeding is accomplished by several means. In Canada, some farmers follow the practice of hand feeding their hogs during the finishing period, giving the pigs only the amount of feed they will clean up in a relatively short time. This feeding method increases the amount of labor required, and also requires very careful management to produce the intended results. Others introduce into the finishing ration enough fiber, such as an extra proportion of ground whole oats, to further limit the energy intake. This is sometimes called a "diluted" ration. So-called "diluted rations" may be self-fed without the additional labor requirements of hand feeding. Some of the larger Canadian hog producers, and the swine test stations, have been able to market twice the average percentage of A grade carcasses produced in Canada partly because of their use of some method of restricting the ration during the latter part of the growing period.

A common practice is to initiate the restricted feeding practice approximately 7 or 8 weeks before marketing. It is estimated that this lengthens the entire production period by about 2 weeks.

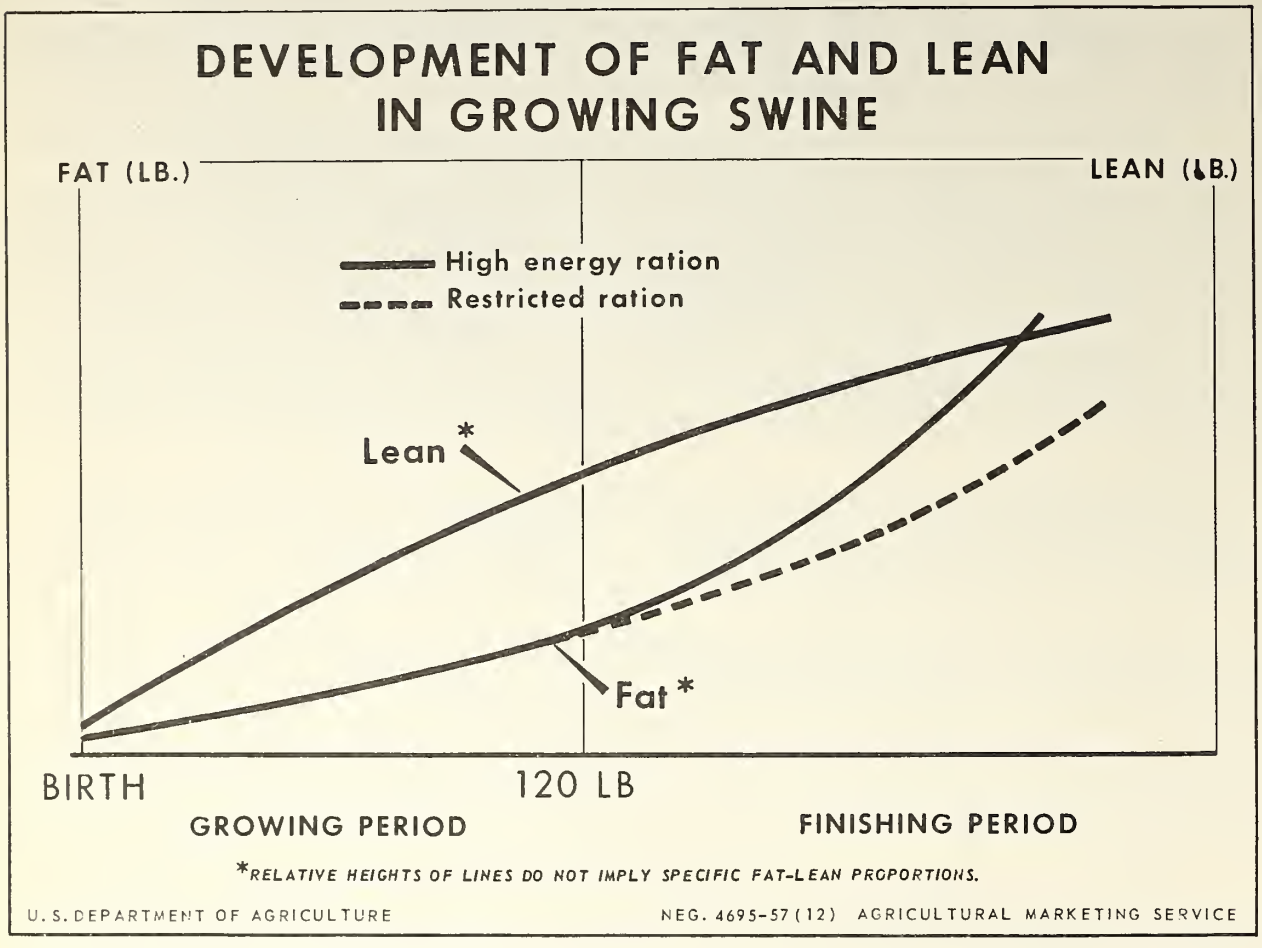

Figure 21.

Although the restricted ration lengthens the finishing period required to reach a given marketing weight, the government and packer premiums and incentives in Canada apparently have been enough to persuade at least some farmers to follow this feeding practice.

Figure 21 is essentially a schematic diagram illustrating normal growth in swine. The figure illustrates the effect of different rations on carcass composition and also can be used to illustrate carcass improvement that might be brought about by breeding.

In meatier strains of hogs, the fat deposition curve is probably flatter. It turns upward later in the finishing period. The flatter of the two fat deposition curves (dashed line) could represent a later maturing hog whose fat deposition rate does not become critical until a later age or weight. A steeper lean deposition curve, if inserted in figure 21, would indicate a greater rate of muscle or lean meat deposition. Hogs having such characteristics would produce satisfactory carcasses at heavier weights without restricted feeding.

It is questionable whether swine producers in the United States, especially in the Corn Belt, would follow restricted feeding practices without being compensated by price differentials greater than are likely to be realized. Most American swine producers will have to use corn as a basal grain concentrate in the ration. A leaner, meatier genotype would be required to produce as lean a type of pork with a corn ration in the Unites States as the Canadians now produce with an oats and barley ration. Producing meatier hogs in the United States will probably require a greater change in the genetic makeup of swine than has already been accomplished in Canada.

APPRAISAL OF CANADIAN EXPERIENCES AND AMERICAN PROBLEMS IN SWINE IMPROVEMENT

The purpose of this section is to appraise the possible applications of Canadian experience during the last 35 years to problems of swine improvement in the United States.

The United States stands at about the same position with respect to its problems of hog marketing in the years ahead as the Canadians stood shortly after World War I. The Canadians, however, had a more dramatic issue at stake--the imminent loss of an important export market. Canadian pork exports fell from about three-fourths of commercial slaughter in 1919 to less than one-third in 1923. Canada was losing its British outlet to Denmark primarily because the Danes produced a superior pork product. Canadian farmers and meatpackers alike were concerned. Farmers were concerned because they saw ahead a period of declining hog prices; meatpackers were concerned because the loss of the British market meant a decline in the volume of hog slaughter in the years ahead. These groups felt compelled to work together and with the Canada Department of Agriculture to develop what would now be called a "crash" program of quality improvement.

The situation facing American swine producers and packers is not as dramatic. The declining demand for pork, and especially for lard, does not have the same elements of crisis as faced the Canadian producers and packers in the early 1920's. The United States has no substantial export market to lose. The pork problem in the United States has evolved so gradually and so slowly that recognition of the problem has come more slowly. This has made it more difficult to obtain concerted, collective action by the principals who have vital interests at stake.

Production

The average quality of Canadian market hogs is very high by U. S. standards. About 97 percent of a sample of 530 Canadian carcasses would have fallen in the U. S. No. 1

and No. 2 grades, with 71 percent falling in the No. 1 grade (table 5). Nevertheless, improvement beyond these present high levels in Canada is not impossible. Some farmers in Canada produce a percentage of A grade carcasses twice the national average.

Canada improved her pork largely because sufficient incentives existed to bring about certain producer responses in the selection and breeding of hogs. This was done during the 1920's and 1930's, by switching from a variety of breeds to one single dominant breed, a white hog of English bacon-type breeding. Since 1940, progress appears to have been more difficult. With the increasing market weights, however, it has probably been significant that Canada has been able to maintain the proportion of grade A carcasses.

Canada's Advanced Registry Program was initiated in 1928, and swine testing stations in 1934. The several similar separate programs in the United States did not get under way until after World War II, and swine testing stations did not develop until after 1950.

In Canada's one official Advanced Registry Program, one basic ration and one system of scoring carcasses are used. This means that strains of hogs can be compared for carcass score and for economy of gain, regardless of where they were tested. In the United States, the National Association of Swine Records has adopted uniform carcass requirements which are used by breed associations in their meat-type certification programs. However, each State or local testing station has its own basic ration and system for scoring carcasses, making comparison difficult or impossible.

The basic feeding rations and carcass scoring systems of the test stations have been changed from time to time in Canada as feed supplies and knowledge of the value of the various factors used in carcass scoring have changed.[12] Contemporary discussions in Canada suggest that, in evaluating test station carcasses, less attention will be paid in the future to some aspects of the carcass score, such as belly score, balance (weight of hams compared to weight of shoulders), and conformation. This change means that more attention will be given to such factors as average backfat thickness and loin eye area, measures which have proved themselves to be better indicators of overall carcass merit. Carcass scoring factors in the United States usually include backfat thickness, area of loin eye, length of carcass, and yield of lean cuts.

Present carcass scoring systems recommended by the National Association of Swine Records in the United States call for minimum and maximum backfat thicknesses which permit a wide range of tolerance in backfat. For example, for hogs from 180 to 200 pounds, average backfat can vary between 1.0 and 1.6 inches. This permits substantial numbers of carcasses that would be grade B carcasses in Canada and would grade in the bottom half of the U. S. No. 1 grade to qualify for certification as meat-type breeding stock in the United States. The wide range in tolerance in effect gives more emphasis to deficiencies in length of carcass and loin eye area as disqualifying factors. The Canadian Advanced Registry Program appears to be moving in the direction of giving backfat thickness greater weight in scoring carcasses.

In producing leaner pork than the United States, Canada has been favored with a feed supply containing a higher proportion of grain concentrates such as oats and barley. In addition, the system of premiums and incentives in Canada has encouraged some farmers to restrict feeding in the latter part of the feeding period so as to decrease the deposition of fat in the carcass.

In the United States, the primary grain concentrate for swine feeding has been and probably will continue to be corn. Because this is true, and because it appears unlikely that farmers in the United States will resort to restricted feeding under current price relationships, it seems that breeding must receive considerably more emphasis in the

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[12] Production Service, Canada Department of Agriculture, "Record of Performance and Advanced Registry for Purebred Swine," October 1954.

United States. A considerably meatier genotype would be required to produce a lean carcass on a typical United States ration than would be required on a typical Canadian ration.

Another difference between the organization of hog production in the United States and in Canada is the relative importance of the swine enterprise on individual farms. In Canada, estimates[13] indicate that in 1951, less than one-fifth of the hogs came from farms farrowing 10 or more litters per year. In the United States, three-fourths of the pigs were born on farms farrowing 10 or more litters in 1954.[14] Hogs are generally a sideline enterprise on Canadian farms. Commercial production is much more common in the United States. This difference offers some promise for more rapid progress in swine improvement in the United States after price differentials and proven breeding stock become generally available. With equal price incentives in both cases, any increase in hog quality would cause a greater increase in returns to large-scale commercial producers than to farmers handling swine as a sideline enterprise. Thus, commercial producers can be expected to respond more quickly in improving swine.

It does not appear that the United States will be required to move to one breed as did the Canadians in improving their general level of pork quality. In selecting strains carrying meat-type genes, or in developing new inbred crosses, it does appear that less conservative goals in carcass characteristics will be required than were used in establishing the several new breeds of hogs in the United States since World War II.

New strains or breeds of swine are needed in the United States which can be carried up to 220, 230, and even 240 pounds and still maintain satisfactory carcass quality on a basic ration of corn and supplement. The average weight of barrows and gilts marketed in the United States at the 8 largest terminal markets during the 5-year period 1953-57 was over 225 pounds. With over 225 pounds as the average, it is apparent that substantial numbers of the barrows and gilts weighed over 225 pounds.

The present organization of swine improvement procedures, at the farm level, in the United States includes (1) State and local swine test stations, (2) on-the-farm improvement programs based on the live probe, and (3) breed association testing and certification programs. At the research level, the work is carried on by the Federal Department and by the various State agricultural experiment stations. However, most of the breeding stock of this country (as well as that of Canada) is still untested as to meat-type performance.

Closer coordination of these separate programs and the adoption of uniform goals, methods, and measures of achievement could provide a means of more rapid and effective swine improvement.

The high heritability of meatiness in hogs, the short time required for hogs to reach breeding age, the short gestation period, and the large litter size combine to offer a potential for more progress at both the farm and research levels. Adequate price differentials between grades would enable more rapid realization of the potential. Research to find more effective ways of evaluating the internal quality of live animals, so that desired breeding stock need not be destroyed, may remove a major handicap to progress.

Marketing

Pork Merchandising and Distribution Programs.--A basic problem in pricing of hogs by grade in the United States has been the relatively narrow value differentials between different grades of hogs. A frequently mentioned solution for this problem is that of carrying the grade all the way to the consumer. If consumers would pay higher prices for

[13] Estimates are based on numbers of hogs on farms June 1, 1951, reported by Dominion Bureau of Statistics. Ninth Census of Canada: 1951, Vol. VI, Part I - Agriculture.

[14] U. S. Bureau of Census. U. S. Census of Agriculture: 1954, Vol. II, General Report.

hams from No. 1 grade carcasses than those from No. 3 grade carcasses, the price differential between live grades of hogs could be widened. The same might apply to the picnic, to the loin, to the belly, and to the Boston butt.

Unfortunately, research results in the United States to date have not conclusively indicated that consumers would be willing to pay such price differentials at the retail level without considerable promotion and advertising. This may be because in past studies the categories of pork cuts used represented simply the grades of the carcasses from which the cuts originated. It is possible that under a system of grading wholesale cuts of pork, a price differential between grades of cuts might be realized. The question still remains, however, whether price differentials at the retail level would be of sufficient magnitude and whether they could be realized on enough to the different wholesale cuts of pork to make their impact felt in terms of wider price differentials for live hogs.

The Department of Agriculture in Canada has also given some thought to this problem. It was decided that further study was required before grade standards for pork cuts, carried through to the trimmed retail cut, could be developed.

Canadian meatpackers have carried the processing of much of their pork forward to the extent that they have nearly eliminated the need for grade standards for many of the cured wholesale and retail cuts. Instead of grading pork cuts according to the amount of excess fat, they simply remove the fat. For some time, Canadians have consumed a considerable proportion of their pork loins as "back bacon," called in the United States, "Canadian-style bacon." The Boston butts also are boned and defatted to the utmost. To the extent that Canadian packers bone and defat their cuts, they are achieving greater uniformity of leanness of their product than would be possible by grading regular wholesale cuts.

Added processing by the Canadians increases the differences in yields of major high-value cuts between the several grades of carcasses, and thereby increases value differentials which Canadian packers can pay to producers between grade A, B, and C carcasses. It also presents a more consistent and desirable product before the retail customer.

The added processing, defatting, and boning have been applied primarily to the cured cuts of pork other than bacon. An important amount of the pork in the United States, especially loins, will still be sold fresh. For these cuts in particular, it appears that wholesale grade standards, carried through to the retail level, might have important applications. For the cured cuts, however, it may be that greater consumer satisfaction can be achieved by processing a standardized product than by grading.

The promotion and merchandising of the boned and defatted cuts, at the higher prices that would be required, would largely be the responsibility of the meatpacking and meat retailing industries.

Carcass Grade Standards. --Specifications for Canadian carcass grade standards were developed to select carcasses for export as Wiltshire sides. Specifications for United States standards were developed much later on the basis of research which demonstrated a relationship between average backfat thickness and the percentage of the high-value lean cuts in a carcass. Although the two carcass standards had different origins, both can be used to effectively separate carcasses having a high proportion of lean cuts and a low proportion of lard from other carcasses which have a lower proportion of lean cuts and a higher proportion of the low-value lard. The Canadian grades appear to cover a narrower range of finish than comparable U. S. grades, and, therefore, are more discriminating. The range of finish covered by the Canadian grades A, B, and C appears to be comparable to the range of finish covered by United States grades 1 and 2.

Both grade standards place primary reliance on backfat thickness as the essential grading device. The Canadians measure backfat at the thickest points over the shoulder and the loin. United States standards use the average backfat thickness. Canadian grade

standards, however, also discount hogs for weight, for type, for roughness, or for pigment (dark skin or dark hair roots). The number of factors for which carcasses might be discounted has created a problem in pricing carcasses of the B grade. Carcasses discounted for weight, type, roughness, or pigment, which, nevertheless, have the backfat specifications for the A grade, usually cut out as well as A grade carcasses. The Canadian packers report that excess finish is still the primary factor accounting for lower cutting yields of high-value cuts. This suggests there is little reason for adding subjective considerations to grade standards in the United States other than those already used. These grade standards were developed from a substantial body of research data which demonstrated that once weight and backfat thickness were known, no other easily measurable indicator of carcass merit appeared to improve the ability of grade standards to sort out carcasses according to relative merit.

There is one measurement, the area of the loin eye, which appears to provide some improvement in sorting out carcasses according to relative value after backfat thickness has been considered. Unfortunately, this measurement is not available until after the carcass is broken down. It cannot be used on carcasses on the killing floor or in the coolers. Research in ultrasonic and other methods of measurement may develop ways of mapping the area of the loin eye on the carcass and on the live hog. If this should be accomplished, it might be possible to improve the present United States standards by incorporating some consideration of loin eye area.

Pricing Hogs According to Quality. --Although no accurate statistics are available, it would probably be correct to say that a majority of the hogs in the United States are still sold on a weight basis, with little attention given to grades in pricing the animals.

In the historical context, the United States stands where Canada was after 1922, when grades for swine were established and before 1928, when swine grading became compulsory in the leading hog-producing Province of Ontario.

The United States has a complicating factor in pricing hogs according to quality, which Canada did not experience. In addition to the Federal or official grade standards which have been available since 1949, there are also State and numerous private packer grade standards.

Several issues confront the swine industry in moving to an effective program of merit selling of hogs by which adequate price differentials are developed by the market, and incentives are permitted to play their important role in carrying the consumer's message through the marketing system back to the producer. If live grades are to be used, one of the issues is whether the merit selling of hogs can best be accomplished by considering grade under the grade-sort method or by the lot-price method. In the grade-sort method, No. 1, No. 2, and No. 3 hogs are separated, and each of these grades is sold at a different price. In the lot-price system, hogs are priced according to an estimate of the distribution of grades within the lot, and occasionally with some estimate of the carcass yield for the lot. This is sometimes called "selling them straight." It is similar to the drove purchase method by which most cattle are purchased.

The lot-price and grade-sort systems of pricing live hogs differ in two respects, (1) the way the animals are graded, and (2) the way the packer's statement of settlement to the farmer is prepared. When the lot-price method is used, the farmer receives a statement indicating the number of pounds of hogs, the lot price, and the total value of the lot. Under the grade-sort method, the statement shows the number and weight of hogs in each grade, and the price and value of the hogs in each grade, as well as the total value of the lot.

It is theoretically conceivable that by the lot-price method hogs might be priced just as accurately as by the grade-sort system. Many believe, however, that the buyer can do a more accurate job of pricing hogs that have been previously sorted by grades. As indicated earlier in this report, when hogs are sold straight (lot-price method), there

are rather strong tendencies to generalize the price. The price for entire lots falls closer to the average for all hogs of the particular weight than would be the case when hogs were grade-sorted.

If the buying system is judged on the basis of price incentives, it appears that the grade-sort system has a definite advantage. A farmer might sell a lot of 20 hogs at a straight price of $20.00 per 100 pounds. On the other hand, he might have sold his hogs on a grade-sort basis. If he had had 5 No. 1 hogs at $20.50 under the grade-sort plan, 10 No. 2's at $20.00, and 5 No. 3's at $19.50, the average price for the lot would be the same, $20.00 per 100 pounds. But his settlement statement under the grade-sort plan would have had an educational impact missed under the straight price. Selling by grade-sort can dramatize the price differences to the farmer more effectively and provide him with more motivation to change his breeding, feeding, and management practices to improve the general quality level of the hogs he produces.

Another issue confronting the swine and meatpacking industries in the United States is the question whether the present optional use of any one of a number of grade standards should continue, or whether this system should be replaced by universal acceptance of a single set of grade standards, applied on all hogs. In the historical context, such a development would bring the United States up to date with Canada during the period of 1928 to 1932, when compulsory grading was being extended from Ontario to all other provinces.

The use of different private grading systems by different packers makes comparison of alternative prices more difficult. When these different grade standards are not well understood by farmers, they give rise to fears that grade standards are used by the packer for manipulative purposes, as bargaining tools. This fear discourages farmer use of grading.

Another question to be faced eventually by the swine and meatpacking industries is the place of the carcass method of pricing hogs. At present, this is a controversial issue, with much of the trade expressing considerable opposition to the carcass system. Nevertheless, it must be recognized that the carcass method is the more accurate system for pricing hogs and a more effective system for relaying price incentives from consumers through marketing channels back to farmers.

One reason for the greater pricing accuracy of the carcass method is that under this system the amount of fill does not affect returns. Feed and water carried in the digestive tract when animals are killed do not affect the weight of the carcass. The farmer is paid only for the pounds of meat and meat products he delivers to the packer. Another reason is that carcass grading is more accurate in evaluating quality factors than live grading. There may be a few outstanding live graders, but a special talent is not required for good results using the carcass grades.

An advantage of the carcass method in encouraging the production of meatier hogs is that price differentials between grades appear more sizable for carcass prices than for live-weight prices. In table 1, for example, an 80-cent price differential per 100 pounds on the carcass basis was comparable to a 40-cent differential on the live-weight basis. The live-weight differential was smaller partly because the hogs with lower grade carcasses tended to have higher dressing percentages, which helped compensate for the lower per-pound value of their carcasses.

A study of pricing accuracy of alternative systems conducted several years ago (fig. 22) illustrates the relative accuracy of pricing by the flat-price live-weight system and the carcass weight and grade system. Each dot represents the price for one lot of hogs. The length of the vertical line connecting the dot to the diagonal represents the pricing error--the difference between price and cutout value. With perfect pricing, all dots would lie on the diagonal line.

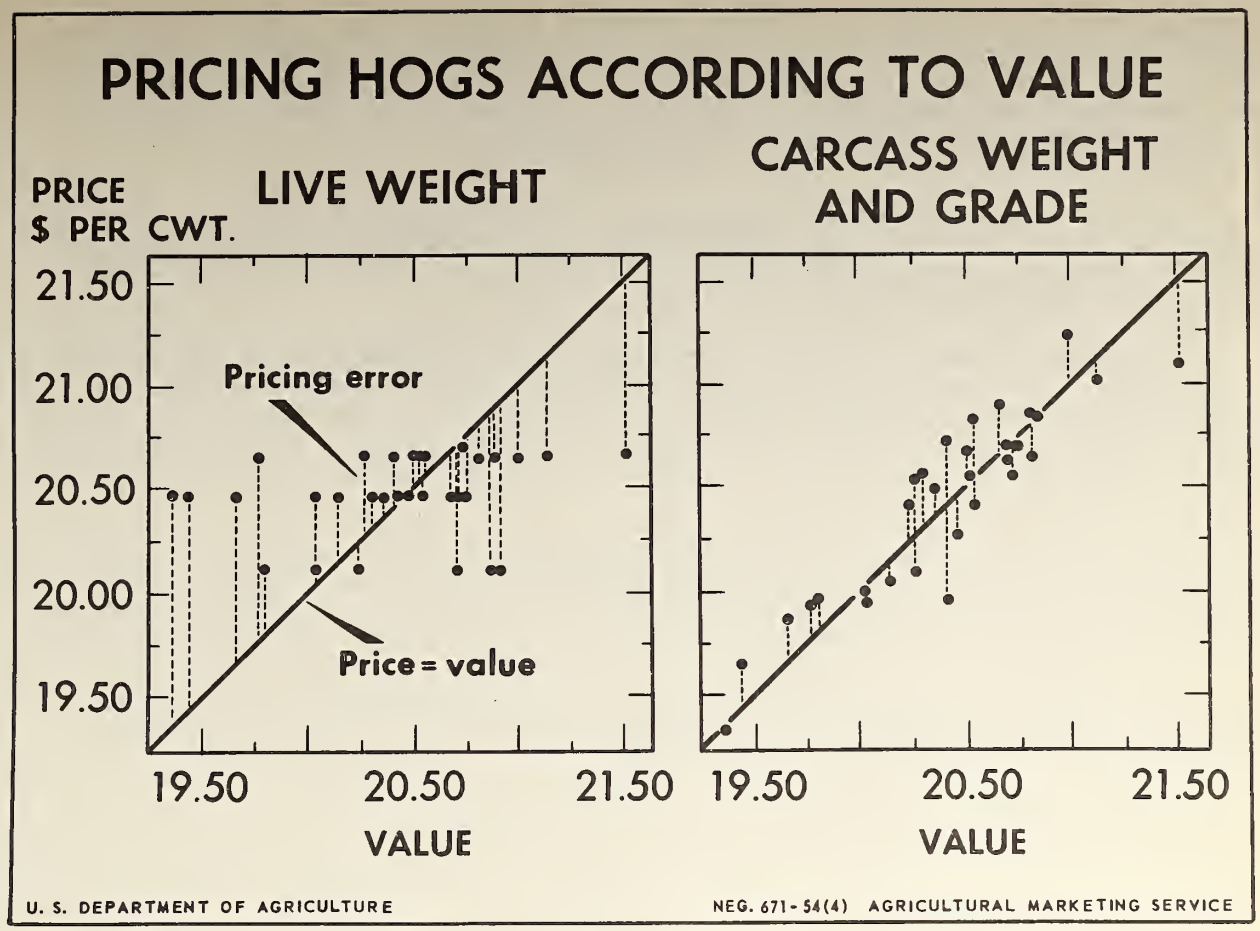

Figure 22.

In this study, the carcass system removed 82 percent of the pricing errors that occurred under the flat-price live-weight system. Live grading with 100 percent grading accuracy would have removed about 53 percent. Even with perfect live grading, there still remain the differences in carcass yields which are of no concern under the carcass weight and grade system. With 80 to 90 percent accuracy in live grading, the live grading system would have removed approximately 50 percent of the pricing errors under the live-weight system.

The carcass method has made only small headway in the procurement of hogs, although more and more packers are offering the option of pricing hogs on this basis. It has begun to make headway in the sale of cattle, especially in California and in Florida, and in the sale of turkeys in the Middle West. This method, nevertheless, provides a more effective incentive for farmers to improve the quality of the product they bring to the market place. It would help the decentralized free-market pricing system in directing our sizable resources of feeds into the production of more of the lean pork that consumers appear to want, and less of the fat that they do not want.

One of the lessons of the Canadian experience over the past 35 years is that progress in improving hogs was rather slow during the period of optional grading. The percentage of select bacon hogs was 15 percent in 1923, and about 17 percent in 1928 (fig. 17). More substantial progress was made when Canada began adopting a compulsory system of grading all live hogs, about 30 years ago. By 1940, the percentage of select bacon hogs

(comparable to present grade A carcasses) almost doubled. Butcher-grade hogs (comparable to present grade C carcasses) dropped from 35 percent in 1928 to about 8 percent in 1940. These hogs are about equivalent in fatness to the bottom half of the U. S. No. 2 grade. Present indications are that hogs equivalent to U. S. No. 1 account for between two-thirds and three-fourths of Canadian production, while the U. S. No. 3 has been almost eliminated from Canadian hog production (table 5).

The basic problems in establishing effective price differentials between grades of hogs or of carcasses in the United States are (1) to generate wider price differentials between the products from different grades, and (2) to relay these wider price differentials to farmers more accurately and more completely.

Wider price differentials between the products could be generated by further processing, boning, and defatting many of the cured cuts, and possibly by developing and using adequate grade standards for other cuts at the wholesale and retail levels. Carcass selling relays these wider differentials to farmers most accurately. But Canadian experience suggests that uniform and universal live grading has also relayed these differentials fairly effectively to producers.

With universal grading as practiced in Canada, and with price differentials equivalent to those paid to farmers by Canadian meatpackers, even greater progress in improving hog quality could probably be achieved in the United States without the assistance of a Federal bonus for the higher grading hogs.

Without wider price differentials, and without widespread or universal grading, Canadian experience suggests that progress in the United States will be slow and that eventual goals to be reached in carcass quality must be more limited.

APPENDIX

Activities of the U. S. Department of Agriculture Relating to the Meat-Type Hog Problem

The United States Department of Agriculture and many of the State agricultural experiment stations have been actively concerned with the development of the meat-type hog.[15] Work was started by the Department in the early 1920's with the establishment of five hog-production testing stations. Although these were discontinued after a few years, breeding research continued through the 1930's and 1940's. Hogs were imported from Denmark in the 1930's, and seven inbred lines of hogs were maintained at the Agricultural Research Center at Beltsville, Md.

Developments after World War II that stimulated progress in meat-type hog production in the United States were: (1) Falling lard prices (it was not until after World War II that lard prices remained consistently and significantly below the value of the live hog on a pound-for-pound basis); (2) the shift in consumers' tastes which has resulted in a decline in the demand for the fatter cuts of pork and in the demand for all pork cuts relative to that for competing meats; (3) the discovery of a simple method of estimating the value of a hog carcass (the discovery that thickness of backfat can be used to give fairly close estimates of the percentage of high-valued lean cuts and of low-valued fat cuts in a carcass, and can thereby be used in grading carcasses); (4) development of the art of live probing to measure backfat thickness in live hogs, permitting evaluation of the quality of hogs on the farm without the necessity of slaughtering them to get the backfat measure; (5) development of a number of swine-testing stations to speed the search for superior blood lines; (6) the offer of some of the packers to buy and pay according to quality; and (7) wider recognition of the meat-type hog problem.

Some of the work after World War II by the U. S. Department of Agriculture and cooperating State agricultural experiment stations on the production and marketing of meat-type hogs is summarized briefly in the following paragraphs.

Eight new breeds of swine are being registered from foundation stocks developed by research. They are the American Landrace, the Beltsville, No. 1, the Beltsville No. 2, the Maryland No. 1, the Minnesota No. 1, the Minnesota No. 2, the Montana No. 1, and the Palouse.

A Regional Swine Breeding Laboratory was established in 1937 through cooperation of the Department and State agricultural experiment stations in the North Central States. Attention was focused on the meat-type hog from the beginning. The laboratory is engaged in work which relates to discovering, testing, and developing plans of swine breeding and selection.

An experiment, "Selection for High and Low Degrees of Fatness in Swine," being conducted at the Department's Beltsville Agricultural Research Center, will determine and illustrate the amount of progress possible in developing meat-type strains of swine using the backfat probe as the only selection device.

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[15] This work has been summarized in greater detail in House of Representatives "Hearings before the Subcommittee on Agriculture of the Committee on Appropriations, Eighty-fifth Congress, Second Session," Activities of the United States Department of Agriculture Relating to the Meat-Type Hog Problem, pp. 1341-1350.

An experiment, "Reciprocal Recurrent Selection for Hybrid Vigor in Swine," also being conducted at Beltsville, is an examination of the practical usefulness of a method of producing a meat-type hog while maximizing the amount of hybrid vigor which usually results from crossing unrelated strains or breeds of swine. The advantage of the method is that the need for developing and maintaining inbred lines is eliminated.

An identification and certification program for meat-type hogs was initiated by the Department in cooperation with a number of Corn Belt and other agricultural experiment stations and the purebred Swine Record Associations. The primary purpose is to assay herds of purebred hogs to locate and identify meat-type animals and strains that consistently produce superior offspring.

A number of other experiments being conducted by the Department have important implications for the development of the meat-type hog, such as swine semen preservation studies and physiological studies.

Laboratories of the Department have conducted and are continuing studies leading to a better understanding of the physical makeup of the hog. The goal of the work is to find improved methods of measuring or estimating quality of pork cuts, carcasses, and live hogs.

The Department and various State experiment stations have been involved in the study of consumer preferences for pork to find which attributes or qualities are important to consumers.

The Department works with farmer cooperatives in helping cooperative marketing associations establish programs for selling hogs on a price differential basis.

The Cooperative Extension Service has been instrumental in obtaining recognition on the part of farmers and others of the long-time trend towards declining demand for lard and fat cuts of pork in relation to lean cuts, and the declining demand for pork in relation to competing meats, as well as in helping establish programs to bring about improvements in marketing and in hog production. Extension has provided leadership in assisting producers to organize swine evaluation stations and on-farm testing and selection of breeding stock of meat type.

Activities of the Canada Department of Agriculture Relating to the Bacon-Type Hog Problem

The Canada Department of Agriculture has a number of research programs pertaining to the development and feeding of their bacon-type hogs. Studies have been made of the effect of various fiber, protein, antibiotic, and energy levels on carcass quality and on other factors.

An experiment is just under way in which 3 herds of about 25 sows are maintained. One herd is selected on the basis of carcass quality of offspring. Another herd is selected on the basis of feed efficiency of offspring, and the third is selected on the basis of both.

A hybridization and selection program, initiated in 1947, has resulted in the Lacombe breed. The breed was developed from the Danish Landrace, the Berkshire, an inbred Landrace-Chester White line developed by the U. S. Department of Agriculture at Beltsville, and a small amount of blood from ancestors of the Palouse breed. Since maximum hybrid vigor, when crossed with hogs now on Canadian farms, was desired, the Yorkshire was immediately eliminated as a possible parent breed. In the limited number of performance tests to date, the Lacombe breed has compared favorably with the Yorkshire in all economic traits considered. It crosses well with the Yorkshire to produce a highly acceptable commercial pig exhibiting hybrid vigor for growth.[16]

[16] Canada Department of Agriculture, "The Lacombe Breed" (four-page leaflet).

An experimental herd of Canadian Landrace swine has been assembled by the Canada Department of Agriculture for appraisal of its performance and for crossing. Though recently introduced into Canada, this breed is increasing rapidly and was second in numbers registered in 1957.

The Ontario Hog Producers' Marketing Plan

From World War II until 1957, hog prices in Ontario have been characterized by considerable stability thoughout the week. Prices for the week were established for hogs at the Toronto public market on the basis of Monday morning's sales. As a general rule, packers in a given area tended to pay the same price for the rest of the week, which in turn had been based upon the Monday Toronto price. (Cattle prices in Canada, however, have always fluctuated from day to day as in the United States.)

From early 1940 until 1948, Canada had produced a large surplus of pork which was bought by the Meat Board and delivered, under contract, to the British Ministry of Food. For considerable periods, hog prices tended to be fixed in some relationship to the contract, and were relatively stable. This led to the situation in which prices established on the public markets early in the week set the pattern for the entire week.

This system had broken down to a large degree by 1952. Then, during the period of foot and mouth disease, the Agricultural Prices Support Board, purchased surplus pork in the form of cuts. This again tended to intensify the week-price system since there was a hog price established for each area. For example, the "floor price" at Toronto was $23.00 (carcass basis) for grade A.

With this rigidity in established hog prices, packers could not bid against each other to maintain or increase their volume of killing operations. Since packers could not bargain with farmers, it became necessary for them to bargain with truckers. Most hogs in Canada are raised on farms with from 2 to 6 sows; the average shipment of hogs from any given farm is under 4 head. Farmers are well acquainted with several truckers in their own communities, but have little direct communication with any packing plant. Since prices were the same at all plants, farmers did not insist that the trucker deliver their small part of the load to any particular packer. The trucker became a key man in the marketing system, deciding which plant was to receive the hogs he hauled from his community.

In Ontario, commodity marketing boards are legally authorized to exercise the exclusive privilege of negotiating sales of certain agricultural commodities for producers if two-thirds of those voting approve. In order to change the hog procurement system, the Ontario Hog Producers' Association organized a Marketing Board for hogs in 1957 and obtained authority to negotiate the sale of all hogs in designated counties (which in February 1958 included 80 percent of the hogs raised in the Province of Ontario). In these designated counties, all hogs must be sent to official gathering stations or assembly points. The Marketing Board has authorized the Ontario Hog Producers' Cooperative to act as the commission agent and negotiate for the farmers. Salesmen at the central office of this cooperative bargain with packers by telephone over the hogs that have been delivered to the various assembly points.

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